DOCUMENT RESUME

ED 454 829 IR 020 808

TITLE	ICCE/ICCAI 2000 Full & Short Papers (Lifelong Learning).
PUB DATE	2000-11-00
NOTE	59p.; In: Learning Societies in the New Millennium: Creativity, Caring & Commitments. International Conference on Computers in Education/International Conference on Computer-Assisted Instruction (Taipei, Taiwan, November 21-24, 2000); see IR 020 792. Some figures contain very small and illegible type.
PUB TYPE	Collected Works - General (020) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	*Adult Learning; Adult Literacy; *Computer Uses in Education; *Educational Technology; Elementary Secondary Education; Faculty Development; Foreign Countries; Higher Education; Information Technology; *Lifelong Learning; World Wide Web

ABSTRACT

This document contains the following full and short papers on lifelong learning from ICCE/ICCAI 2000 (International Conference on Computers in Education/International Conference on Computer-Assisted Instruction): (1) "A Study on the School Information Technology Pilot Scheme: Possibilities of Creative and Lifelong Learning" (Siu-Cheung Kong, Wing-Kee Au, and Sai-Wing Pun); (2) "Attitudes of Older Taiwanese Adults toward the Elderhostel Model of Residential Educational Programs" (Bobbie T. Biggs and Hsiu-Ying Chang); (3) "CedarLearning: The Development of Learner-Centred Environments" (Tanya Wilson, Jeanette Muzio, Roger Mundell, Denise Stockley, Laureen Vickery); (4) "Design and Implement CAI Programs for Adult Literacy Learners" (Pi-Chi Chen); (5) "Development and Evaluation of Web-Based In-Service Training System for Improving the ICT Leadership of Schoolteachers" (unavailable in English); (6) "Empowering Secondary School Teachers To Effectively Exploit Internet Resources for the Enhancement of Teaching and Learning" (Y. T. Yu and B.C. Chiu); (7) "Learning from the Learning of Other Students" (Stuart Garner); (8) "Strategies for Searching in the WWW" (Meng-Jung Tsai); (9), The Development of a Multimedia Program for Teachers To Integrate Computers into the English Curriculum" (Ya-Fung Chang); (10) "The Production of Web-Based Interactive Video from Structured Script" (Cheng-Huang Yen); and (11) "The Web of the Teacher Professional Development" (Chia-Ling Hsu, Hsiao-Ching She, and Min-Sheng Lin). (MES)

ICCE/ICCAI 2000 Full & Short Papers (Lifelong Learning)

Proceedings

Content

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The web of the Teacher Professional Development

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A Study on the School Information Technology Pilot Scheme: Possibilities of Creative and Lifelong Learning

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The Hong Kong Special Administration Region (HKSAR) Government is promoting the use of Information Technology (IT) in education for creative and lifelong learning. A two-year IT-pilot scheme has been launched among 10 primary schools. The first phase of the current study had reported on the planning and implementation of the schools in the first year of the scheme. This paper reports findings from the second year. All 10 primary schools are studied by a case-study approach. This phase aims to investigate the effect of using IT in learning and teaching. Data were collected via browsing web sites, visits and interviews. The research results show that some schools are optimizing students' opportunities for accessing the computing and networking capabilities. Acquiring a LCD projector in each general classroom is an important part of the IT infrastructure for promoting the use of IT in schools. All schools are motivating teachers to use IT to improve the traditional mode of learning and teaching by developing multimedia-teaching unit. Schools need to develop teachers' sense of harnessing technology for rethinking and redesigning educational practice through staff development. It is speculated that school policy plays a crucial role in promoting the paradigm of creative and lifelong learning.

Keywords: **IT in education, lifelong learning, school policy**

1 Introduction

Within the nine-year compulsory education system in Hong Kong, students have to learn in large groups with very few choices of school curriculum. Teachers have to teach more or less the same subject knowledge specified in the formal curriculum and approved textbooks. Chances for learners to keep in contact with the real life experiences were limited. Cheng [1] points out that this kind of learning from traditional school experience is an isolated mode of learning. Perelman [2] further argues that such kind of educational management operated by the government is similar to the socialism planning economy mode of operation. It can be surmised that curricular contents and instructional methods that are structured and rigid do not really cater for the needs of learners in the information era. These arguments indicate that the traditional school education system is seriously "disconnected" from the information society. Contents learnt from school education can rarely be used in real life. In this context, the Hong Kong Special Administration Region (HKSAR) government is promoting the use of Information Technology (IT) in education for creative and lifelong learning to cope with the rapid changes in contemporary society [3, 4, 5, 6]. A document on the reform proposals of the education system review of the HKSAR government stated its vision as follow:

Students are the focus of the whole education reform. **The basic premise is to enable every individual to pursue all-round development through lifelong learning.** ... However, in tandem with changes taking place in the community, our students' learning needs have also changed. It is essential or our education system, including its academic structure, content and modalities, to be duly adjusted in response to these changes [6,

p.4].

A two-year IT-pilot scheme was launched in September 1998 for 10 primary schools and 10 secondary schools. These pilot primary schools, with the support of US$480 000 from the government, were expected to experiment with integrating IT in learning and teaching with a resultant change in the paradigm of learning and teaching which may empower both the learners and the teachers. A study on the planning and implementation of the first year of the scheme in nine primary pilot schools was conducted by using a case-study approach and the results were reported [7, 8]. This paper reports the second phase of this study. During the second-phase study, the research team revisited the schools and aimed at investigating the changes in the mode of learning and teaching of the pilot schools experienced in the second year of the scheme after the implementation of the IT infrastructures in the first year of the scheme.

There are various kinds of models, which attempt to conceptualise the integration of technology into learning and teaching, for example, the Concern-Based Adoption Model (CBAM), the Planning Process Models (PPM) and the Technology Maturity Model (TMM) [9, 10, 11]. CBAM serve as a diagnostic tool for the technology integration planning and implementation by studying the stages of concerns of the planners. CBAM considers developing items in different stages of the integration plan. It better suits longitudinal research. PPM provides general guidelines on the planning process that emphasizes on establishing a comprehensive administrative framework for the technology integration plans and the planning must address the local situation. PPM is especially designed for setting up a well-organized administrative structure and ensuring the implementation of the plan. PPM focuses on the study of a particular school. TMM mainly evaluates the depth of integration of IT with education through observation, such as school planning and implementation of IT in learning and teaching. It also concerns the daily use of IT in school and studies the effectiveness. TMM is appropriate for the study of the implementation of IT in education of several schools for identifying favourable factors or obstacles.

The framework of this study is derived from the guidelines of TMM. Five main items of the model are selected for detailed study. They are student use, teacher use, curriculum integration, staff development, and school policy. This research will report on the daily use of IT in learning and teaching and will discuss the effectiveness of integration. IT in education is developing at its initial stage in Hong Kong. Schools have limited experiences on integrating IT in education. The experiences of pilot schools can be a useful reference for most of the schools intending to integrate IT into learning and teaching. The findings of the study will be important for promoting the use of IT for creative and lifelong learning in Hong Kong.

2 Research Question

The first phase of the study had reported on the planning and implementation issues in the first year of the scheme. Nine pilot primary schools were studied. This study is the second phase of the research and all 10 IT pilot primary schools participates. During this phase, the research team re-visited the nine schools and also visited the one missed in the first phase. The aim of the study is to further investigate the pilot schools' use of IT and to obtain an in-depth knowledge profile of the schools' integration of IT into the curriculum. The core research question of the study is to investigate the changes introduced by the use of IT in learning and teaching with particular reference to the five selected items in the framework of the study [12, 13]. In this regard, two subsidiary research questions are explored.

1. How does IT improve the traditional learning and teaching paradigm?
2. How learning can be enhanced for the emerging paradigm of creative and lifelong learning in the information era when learners are empowered by IT?

3 Research Methodology

A case-study approach was adopted in this research in order to obtain the in-depth profile of the pilot schools relating to the implementation of IT in education [14]. Data were collected via browsing school web sites; school visits and interviews. Table 1 shows the web sites of all pilot primary schools in Hong Kong.

Table 1: Web sites of all pilot primary schools in Hong Kong and number of visitors as at the 16, May 2000

URL	Visitors	URL	Visitors
http://www.buddhist-wingyan-sch.edu	No counter	http://kws.hkcampus.net/	No counter

.hk/			
http://bwcss.school.net.hk/	40200	http://www.lkw.edu.hk/	1951
http://am.npgps.edu.hk/	No counter	http://www.tpomps.edu.hk/	123453
http://plklht.school.net.hk/	72984	http://www.ychchtps.edu.hk/	No counter
http://www.pm.plkhsn.edu.hk/	28126	http://www.skhsjs.edu.hk/	No counter

Samples of lessons plans of teachers and students' work were also collected [15]. These data were organised and interpreted according to the framework of the study. During the school visits, interviews and site visits to all IT facilities of the schools were conducted. The interviewees included school principals and IT coordinators. In all, ten school principals or deputy principals and five IT coordinators were interviewed.

4 Results and Discussions

The initial research result of this phase of study shows that schools are struggling for offering opportunities to students for creative and lifelong learning by different approaches. This section will report on the development or changes of the pilot schools observed in the second phase of the study on the five selected items. They are students' use of IT for learning, teachers' use of IT for teaching, integration of IT in the curriculum, staff development and school policy.

4.1 Students' Use

All ten pilot schools offered Computer Awareness Programme (CAP). This programme provided software operation skills and basic IT knowledge to students. Nine schools scheduled these programmes in regular lessons. One school infused the awareness programme contents in various subjects according to the nature of the content. For example, spreadsheet was taught in mathematics lessons and word processing and email were integrated in English lessons. Results of the first-phase study indicated most students in the pilot schools might access to the computers only once or twice a week in the computer awareness lessons [7, 8]. Students could use computers before or after school hours, recesses or lunch breaks but students' use was infrequent in the first phase. There is a change observed during the site visits of the second-phase study. Students had access freely to the computing and networking facilitates around the environment of some schools. Table 2 shows the location of free access to computing and networking facilities for students in the pilot schools. Schools with more free access locations for students are put towards the right-hand-side of the table.

Table 2: Location of free access to computing and networking facilities for students in pilot schools

Location of Access	School 1	School 2	School 3	School 4	School 5	School 6	School 7	School 8	School 9	School 10
Classroom Computers			✓				✓	✓	✓	✓
Computer Classrooms		✓		✓	✓	✓			✓	✓
Library Computers	✓			✓	✓		✓	✓	✓	✓
Corridor Computers						✓				✓

There were computers free to use in the general classrooms, computer classrooms, libraries and the corridors. According to the figures estimated from the pilot schools, the home computing access rate ranged from 30 to 60 percent. Therefore free access of computing and networking facilities become an important tool to achieve equity and to promote a school culture of using IT to learn and teach. On average, there were 1.8 computer classrooms in the ten pilot schools. Sixty percent of the schools arrange their computer rooms for students' access besides scheduled classes. Seventy percent of the schools provide 3 to 10 computers in the library for drop-in access. Half of the schools admitted students to use computers in general classrooms. The number of classroom computers ranged from 1 to 4. It was interesting to note that some pilot schools even allowed students to share the only classroom computer with the teachers. All pilot schools allowed students to explore freely on the World Wide Web (WWW) except some of them used filters to bar access to pornographic sites. It could be speculated from the site visits that optimising students' free access opportunities might provide a solid foundation for creative use of the computing and networking capabilities and hence might nourish skills and processes that could support learning as a lifetime habit [16].

4.2 Teachers' Use

A teacher may need to deliver curricular contents in the traditional paradigm of learning and teaching. A teacher may serve as a learner's counsellor, a coach and a facilitator who extends the intelligence of the students by helping them in the emerging paradigm of creative and lifelong learning in the information era [16]. No matter with which paradigm teachers are working, there are chances that learners and teachers need to share and communicate. The existing class structure as learning group requires support to facilitate such sharing and communication in the general classroom. There is preparation work for teachers to carry out their roles using the computing and networking facilities of general classroom.

Three kinds of technical installation modes were reported in the first phase of the study [7, 8]. They are: TV connection, fixed LCD, and mobile LCD. TV connection needs a TV connector to connect the classroom computer and the classroom TV for display. TV sets are standard equipments in general classrooms. Fixed LCD set up requires the setting up of a ceiling-mounted classroom LCD projector for projection but there is no set up work during routine use. Mobile LCD set up requires the transportation of LCD projector for on-site setting. Some schools provide desktop computer in general classroom while the other provide school notebook computers. Teacher needs to obtain both a projector and a computer to conduct class presentation in general classroom. Table 3 summarizes the number of schools by mode of projection preparation and by type of classroom computer.

Table 3: Number of schools by mode of projection preparation and by type of classroom computer

Type of Classroom Computer	TV Connection	Mobile LCD	Fixed LCD
Provide Notebook Computer for Classroom Use	1	3	1
Provide Classroom Desktop Computer	1	1	3

All schools in the pilot scheme provided computing and projection facilities for class use in general classrooms. Teachers could use the facilities to deliver teaching contents through the projection screens or TV sets. Teachers could also conduct interactive teaching by retrieving multimedia teaching units from the Intranet or browsing teaching resources from the Internet. Students could use the facilities to present their project work to their classmates and teachers.

Results of the first phase study indicated that teachers of the pilot schools used the IT facilities more frequently in their workplace for those schools installed ceiling-mounted digital projectors in general classrooms [7, 8]. The second-phase of the study confirmed this case and there was a further development of the trend. Although the cost of setting up a ceiling-mounted LCD projector was expensive, which costed around US$4000 per projector and set up, it was commented as worth for promoting the use of IT in learning and teaching. Teachers showed willingness to use the IT facilities in general classrooms when it was so convenient and easy to carry out their work by using these facilities in classrooms. Table 4 tabulates the findings of the current study on the planning, acquiring and existing distribution of LCD projectors of pilot schools.

Table 4: Planning, acquiring and existing distribution of LCD projectors of pilot schools

Distribution of LCD Projectors	School 1	School 2	School 3	School 4	School 5	School 6	School 7	School 8	School 9	School 10
a. Existing Projector per School Hall	0	1	1	1	1	1	N.A.	1	1	1
b. Existing Projector per Computer Classroom	1	1	1	1	1	1	1	1	1	1
c. Existing Projector per General Classroom	0.25	0.23	0.25	0.25	0.25	0.25	1	1	1	1
d. Existing TV Connector per General Classroom	1	0	0	0	0	1	0	0	0	0
e. Acquiring Projector per General Classroom					1	1				
f. Planning Projector per General Classroom		1	1							

Results of the study showed that eighty percent of the pilot schools installed LCD projectors in their school halls for large group sharing and presentation. All computer classrooms of the pilot schools possessed ceiling-mounted LCD projectors for instruction and class presentation. Forty percent of the pilot schools set up ceiling-mounted LCD projector in all general classrooms. The ratio of existing projector per general classroom was 1. The other six schools had such ratio ranged from 0.23 to 0.25. Two schools resolved the problem on classroom projection by using TV. However, one of the schools told the research team that ceiling-mounted projector would soon replace TV display because projector could provide better quality

display and the school had acquired sufficient funding for the replacement. For the other four schools, one of them acquired funding for updating the projector per classroom ratio to 1; two of them were planning for the updating but there was no funding at that moment; and another one of them was designing a rotational plan of the school timetable so that all classes could use the ceiling-mounted LCD projection for a certain day of the week. In other words, nearly all schools recognize that ceiling-mounted LCD projection was a necessary tool for presentation in classroom. This finding indicated that integrating IT into learning and teaching needed the support of the IT facilities and those issues such as their readiness, convenient to use and reliability must be addressed.

4.3 Integration of IT in Curriculum

All pilot schools attempted to integrate IT in school curriculum. Data collected from the first phase of the study indicated that there were three ways of curriculum integration. They were (1) interactive delivery of multimedia-teaching unit, (2) presentation of digital knowledge object, and (3) active learning. Interactive delivery of multimedia-teaching unit refers to the use of interactivity and multimedia capability of the computer to deliver units of curriculum contents. Teachers themselves develop most of the teaching units. The main aim of this type of integration is to improve the efficiency of teaching. Presentation of digital knowledge object means teachers present knowledge objects such as pictures, animations, or videos related to the curriculum to students. The main objective of this type of integration is to offer authentic stimuli facilitating class discussion. The third type of integration is to organize learners to learn actively when they are empowered with IT.

All teachers and school principals in the pilot schools showed a strong sense of developing multimedia-teaching unit for improving the traditional classroom learning and teaching activities. The general phenomenon is that there was a great demand on the multimedia-teaching units but the supply was scarce. This was the results of the study of the first phase. Data collected from interviews, site visits of classroom, browsing school websites and Intranets, teaching plans and sample work of students from the second phase of the study indicated that the three ways of curriculum integration were still dominant but the proportion of the three types of integration had changed and the ways to advocate active learning were extended. Active learning included not only project-based work but also learning-on-demand. Table 5 summarizes the three types of integration of IT in curriculum. Pilot schools practising project-based work is denoted by a letter "a" and learning-on-demand by a letter "b" in table 5.

Table 5: Types of Integration of IT in Curriculum

Types of Integration	School 1	School 2	School 3	School 4	School 5	School 6	School 7	School 8	School 9	School 10
Multimedia-Teaching Unit	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Digital Knowledge Object				✓	✓	✓	✓	✓	✓	✓
Active Learning				b	b	B	a, b	a, b	a, b	a, b

Results of the current study clearly indicated that developing multimedia-teaching units for improving traditional classroom teaching was still the dominant type of integration. However, there were some further developments. One of the pilot schools stated that they had developed all multimedia-teaching units for the traditional curriculum. This school planned to deliver one-third of the teaching units on its Intranet for students' self-directed learning. The other nine schools required teachers to participate the development by producing some teaching units. Most schools required teachers to develop two multimedia-teaching units in an academic year. One school started to assist teachers to develop web-based learning contents with feedback instead of developing multimedia-teaching units. Another school revised its plan of developing teaching unit by requesting teacher to design storyboard and provide digital knowledge objects. The implementation work would be handed over for commercial software vendors.

The percentage of pilot schools, using the computing and networking capabilities for presentation of digital knowledge objects, increased from twenty to seventy. There were at least two reasons. Firstly, digital knowledge objects could be collected relatively more easily than developing multimedia-teaching units. Presenting digital knowledge object may enhance the effectiveness of teaching. Interview results reflected that knowledge objects were particularly applicable to subjects like General Studies, Art, Music, Physical Education and Civil Education. Digital knowledge objects such as pictures, music and videos allow students to learn by simulation, and learn how to appreciate. They help students to act with sympathy, and may stimulate discussion and critical thinking.

The third type of integration increases even more. The ratio of pilot schools, adopting this type of integration, increased from less than ten percent to seventy percent. These schools encouraged and organized learners to learn actively with IT. There are two types of activities that advocate learners to learn actively. They were (a) project-based work, and (b) learning-on-demand. One of the prominent learner-centred activities was to organize learners to do project-based work. Learners empowered by IT could use tools such as the search engines and presentation software to collect data and present information. This type of integration may facilitate collaborative learning and can polish lifelong learning skills.

Schools found that a content-rich Intranet can encourage learning-on-demand learning. Teachers discovered that learners liked to revise those multimedia-teaching units used by teachers. Two schools provided digitised Educational TV programme on video server or VCD for students' free access. Students could access these learning resources on demand. During the school visits, it was observed that students began to access schools' Intranet to retrieve learning resources and teacher's multimedia teaching units. A variation of learning-on-demand type of activity is learning-on-demand with feedback. Learning-on-demand with feedback attracted learners to learn actively by providing immediate feedback. Two of the pilot schools installed virtual CD towers in their Intranets. Learners could access educational CD-ROMs by connecting to the school Intranets. These CD-ROM learning materials were attractive to students because feedbacks were usually provided and learning pace could be adjusted. Another pilot school developed web-based learning materials with feedback. It was speculated that feedbacks could motivate students to learn.

4.4 Staff Development

Results from the study of pilot schools in the first phase indicated that most schools were organising school-based training for developing teachers' competencies in using technology for learning and teaching. School-based staff development solved some problems like tailor-made training for teachers of the teaching environment. However, school-based staff development also limited the perspective of teachers on the potential of technology to improve only the traditional paradigm of learning and teaching. This argument is supported by the fact that all pilot schools regarded developing multimedia-teaching unit as a prominent part of integrating IT in school curriculum. It was observed that this was still the dominant approach in the second year of the IT pilot scheme. It could be inferred that most schools were adopting the gift-wrapped approach in promoting IT in education by adding technology to traditional educational practice [16]. However, the gift-wrapped approach will limit the development of skills and processes of learner that support learning as a lifetime habit. Therefore it is critical to conduct staff development by developing teachers' sense of harnessing technology for rethinking and redesigning educational practice.

Staff development is the key for cultivating culture of learning and teaching. Therefore, teacher's development on IT competency should not just focus on developing teachers' IT ability but should also provide space to encourage teachers to redesign educational practices for creative and lifelong learning [17]. It is speculated that organizing staff development by visiting schools with best practices on redesigning educational practice could facilitate cultural shift. This kind of activity may excel the emerging paradigm of learning and teaching in the information era.

4.5 School Policy

All schools attempted to articulate policies to address is sues derived from implementing IT in education. The following are the observed common policies of the pilot schools on integrating IT in the school curriculum. Firstly, organizing CAP for students. Secondly, requiring all teachers to contribute in the development of multimedia-teaching units. Thirdly, advocating teachers to share the developed teaching-units within the school. Fourthly, providing computing and networking capabilities in classroom for learning and teaching.

The following are individual policies on integrating IT in the school curriculum advocated by some pilot schools:

- Optimizing students' opportunities for accessing the computing and networking capabilities of the school.
- Organizing the computer awareness curriculum to synchronize with application for learning subject curriculum.
- Reinterpreting and reorganizing the traditional school curriculum to cope with the changes introduced by IT.
- Optimizing students' opportunities to access curriculum learning resources.
- Encouraging teachers to visit schools demonstrating best practices on IT in education.
- Encouraging students empowered by IT to do project-based work.

It can be speculated from the last three common policies that all pilot schools are working for improving the traditional learning and teaching practices using the computing and networking capabilities. However, the individual school policies on integrating IT in curriculum reflect that some pilot schools are attempting to establish a favorable environment to welcome the emerging paradigm of learning and teaching. Principals should work with teachers to think and design school policies for such a pursuit.

5 Discussions and Implications

The core research question of the study is to investigate the changes introduced by the using of IT in learning and teaching. This section will discuss the two subsidiary research questions from the result of the study. Firstly, **what are the observed roles of IT in improving the traditional mode of curriculum instruction?** Secondly, **what are the critical factors identified from the study that will enhance learning for the emerging paradigm of creative and lifelong learning when learners are empowered by IT?**

5.1 Improving Traditional Curriculum Instruction

Exploring ways to improve classroom teaching is the main concern of principals and teachers in the pilot scheme. Joyce and Calhoun [18] studied the effectiveness of teaching mode on students' learning for more than forty years. Results of their studies indicated that learning should include both the memorization of factual knowledge and knowledge construction. There is the basic knowledge of the core school curriculum, such as the fundamental knowledge for learning language and mathematics, which need effective transmission. There are also parts of the curriculum that involve conceptual understanding, communication skill, problem solving ability and creativity. Teachers should assist students to learn them by knowledge construction and assist learners to learn how to learn such ability. Traditional curriculum instruction put efforts to knowledge transmission. The emerging paradigm draws focus to knowledge construction.

Results of the study indicated that the use of IT could improve traditional curriculum instruction in two ways. They are **interactive delivery of multimedia-teaching unit** and **presentation of digital knowledge object**. Teachers of the pilot schools reflect that interactive delivery of teaching contents and presentation of digital knowledge object can shorten teaching time and may enhance teaching quality. There are three main reasons. Firstly, context of teaching and scenes of discussion can be displayed in one shoot. Teachers can ask contextual questions or stimulate students to think immediately with the help of the authentic presentations. Time can be saved from wordy description of scenarios or spending time on sticking diagrams on boards. Secondly, adopting multimedia technology and interactivity of computing capability can assist the teaching of abstract concepts. Interactive teaching contents can be easily replayed for consolidation of concept to be learnt. Therefore the efficiency and effectiveness of learning and teaching may be attained with the help of multimedia-teaching units. Thirdly, there are many drill and practice exercises in the traditional paradigm of learning and teaching. Teachers spend quite a lot of time on validating answers with students. With the help of the TV sets or LCD projectors, teachers can display answers and check them with students efficiently. Time for writing answers on board or reading answers aloud can be saved. Time saved from efficient teaching maybe used for exploring possibilities of learner-centred learning.

5.2 Possibilities of Creative and Lifelong Learning

In responding to the need of every individual to become a lifelong learner, one of the main objectives of the school IT pilot scheme is to develop students with lifelong learning abilities. "Lifelong learning is a continuous engagement in acquiring and applying knowledge and skills in the context of self-directed problems" [16, p.12]. Therefore, learners in the information era are required to work independently, to possess skills and abilities to learn, to communicate and work collaboratively with workmates, and to work with self-initiatives.

Results of the study indicates that those pilot schools which advocate active learning such as group project work and learning-on-demand will favor learners to meet the need of the future society. IT facilities themselves cannot enhance learning and teaching for the emerging paradigmof creative and lifelong learning. It depends on how the learner makes use of the IT facilities to either learn independently or work collaboratively with their workmates. Establishing school policies, such as optimizing students' opportunities for accessing the computing and networking capabilities, organizing a coherence computer awareness curriculum to support subject curricular learning, and reducing curriculum content of the traditional formal

curriculum to cater self-directed work, will increase the possibilities to support learners to learn like a lifelong learner. For example, using those expensive classroom LCD projectors as content delivery tool or group project presentation and communication tool will be one of the reliable indicator to illustrate the possibilities of creative and lifelong learning of our learners.

Therefore, pilot schools desire to contribute in the information era should provide not only **a convenient and reliable IT infrastructure** for learners and teachers, but should also develop **a content-rich Intranet** and devise **appropriate school policy** to support and promote lifelong learning. Whether IT facilities can enhance the paradigm of learning and teaching depends on how learners make use of the facilities to learn independently or work collaboratively in projects with their workmates. Devising school policy to promote the emerging paradigm will be a crucial role of principals and teachers. School policy should be formulated from **strategies developed by principals and teachers**, who rethink and redesign educational practice for lifelong learning support.

6 Conclusion

Five main items of the TMM model were selected for detail study in this research. They were the student use, teacher use, curriculum integration, staff development, and school policy. They formulated the framework of the study. The initial research results of the study show that some pilot schools are **optimizing students' opportunities** for accessing the computing and networking capabilities of the school environment. It is also speculated that acquiring a **LCD projector in each general classroom** is an important part of the IT infrastructure for promoting the use of IT in schools. The convenient use principle for acquiring IT infrastructure was proposed in the first phase of the study and was re-confirmed by the current study. All schools are motivating teachers to use IT in order to improve the effectiveness of the traditional mode of learning and teaching. All schools are **developing multimedia-teaching units** as one way of integrating IT with the existing school curriculum. Seventy percent of the schools integrate IT with the curriculum by selecting digital knowledge objects for presentation. Some schools are struggling for offering opportunities to students for active learning. It is critical to conduct staff development by developing teachers' sense of **harnessing technology for rethinking and redesigning educational practice**. Four **common school policies** of using IT to improve the traditional paradigm of learning and teaching are identified. They are organizing CAP; developing multimedia-teaching unit; sharing the developed teaching-units; and providing computing and networking capabilities in classroom. A number of individual school policies are identified from some of the pilot schools for promoting active learning.

Results of the study show that**IT plays two roles to improve the traditional mode of learning and teaching**. They are the interactive delivery of multimedia-teaching unit and the presentation of digital knowledge object. Time saved from efficient teaching may be used for exploring possibilities of learner-centred learning. **Four factors were identified from the study as critical to enhance learning for the emerging paradigm of creative and lifelong learning**. They are a convenient IT infrastructure, a content-rich Intranet, appropriate school policy and strategies for lifelong learning support. School policy should be formulated from rethinking and redesigning current educational practice for lifelong learning support. This study is still in progress. Further result of the research will be reported after collecting more detail data from the pilot schools.

Acknowledgement

This research [RG999040] was supported by the Hong Kong Institute of Education. The authors would like to acknowledge the support of the Institute and to express gratitude to the 10 IT pilot schools participated in this study.

References

[1] Cheng, Y.C., "A CMI• • Triplisation paradigm for reforming education in the new millennium", International Journal of Educational Management, Vol 14, No. 4, (2000).

[2] Perelman, L.J., "School' s out • • the hyperlearning revolution will replace public education", Wired Vol 1, No. 2, (1993).

[3] Tung, C.H., http://www.info.gov.hk/pa97/english/patext.htm(accessed on July 20, 2000).

[4] Education and Manpower Bureau, "Information technology for learning in a new era: Five-year strategy 1998/99 to 2002/03", Hong Kong: Author, (1998).
[5] Education Commission, "Review of education system: Framework for education reform", HKSRA: Author, (1999).
[6] Education Commission, "Review of education system: Reform proposals", HKSRA: Author, (2000).
[7] Kong, S.C., & Pun, S.W., "Information technology and school education: A critical reflection", Hong Kong: Joint Publishing (Hong Kong) Company Limited, (2000).
[8] Kong, S.C., Au, W.K., & Pun S.W., "A Case Study on the Implementation of Information Technology Education Pilot Scheme in Hong Kong", Advanced Research in Computers and Communications in Education Volume 2, Amsterdam: IOS Press, pp. 27-34, (1999).
[9] Illinois Staff Development Council, http://isdc.org/CBAM.html (accessed on July 20, 2000).
[10] National School Boards Association (NSBA), "Plans & policies for technology in education: A compendium", VA: National School Boards Association, (1995).
[11] Edmin Open Systems, http://www.edmin.com/tp/tmm.cfm (accessed on July 20, 2000).
[12] Pelgrum, W.J., & Anderson, R.E. (Eds), "ICT and the emerging paradigm for life long learning: A worldwide educational assessment of infrastructure, goals, and practices", Amsterdam: IEA (1999).
[13] Okamoto, T., "The framework and its meanings of new curriculum for Information Technology-Education from primary to senior high school in Japan", Educational Technology Research, Vol 20, No. 1-2, pp. 25-32, (1997).
[14] Kember, D., Lam, B.H, Yan, L., Yum, J.C.K., & Liu, S.B. (Eds.), "Case studies of improving teaching and learning from the action learning project", Action Learning Project: Hong Kong Polytechnic University, (1997).
[15] Crompton, R. & Mann, P. (Eds.), "IT Across the Primary Curriculum", Singapore: Cassell, (1996).
[16] Fischer, G., http://www.cs.colorado.edu/~l3d/ (accessed on July 20, 2000).
[17] Au, W.K., Kong, S.C., Leung, K.P., Ng, M.W., Pun, S.W., "Levels of Information Technology (IT) competency core course elements and assessment tools for teacher training in IT in education", Hong Kong: Education Department, (1999).
[18] Joyce, B., & Calhoun, E., "The conduct of inquiry on teaching: The search for models more effective than the recitation", International Handbook of Educational Change, Great Britain: Kluwer Academic Publishers, pp. 1216-1241, (1998).

ATTITUDES OF OLDER TAIWANESE ADULTS TOWARD THE ELDERHOSTEL MODEL OF RESIDENTIAL EDUCATIONAL PROGRAMS

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The demographic characteristics of Taipei Evergreen College participants were identified. Since females outnumbered males, housekeeping was most often indicated as an occupation. Most of respondents were 65 to 69 years of age, married, healthy, fully retired, possessed a college degree, and were living with spouse with a monthly income between NT$ 30,000 to NT$ 39,999. The students' attitude toward the Elderhostel program was significantly influenced by two demographic variables: gender and health status. No significant differences were found with age, household income, occupation, level of education, with whom they reside, marital status, and retirement status. Reasons related to learning were identified as the most important reasons that influenced participation for both female and male respondents. The majority of respondents felt that the factors presented in each of the statements did not limit their participation. Nevertheless, the respondents in this study indicated that the length of the program, the time program offered, and accommodations were the first, second, third factors in the list. Respondents in this study had a positive opinion toward the Elderhostel program and demonstrated an interest in cognitive growth. It was concluded that the Elderhostel program was applicable to Taipei Evergreen College students but needed to be modified as suggested in the implications.

Keywords: **Lifelong Learning, Elderhostel Program, Older Learners**

1 Introduction

Since the 1920s, the Republic of China (Taiwan) has gradually entered a landmark "period of demographic transition" [43, p. 428]. In recent years, a consequence of the improvement of nutrition and public hygiene, both the death rate and the birth rate have been substantially changed. Studies reported that the birth rate was at an all-time low, and the decline in mortality rates has increased life expectancies for men and women [39, 43]. This shift has resulted in the inevitable phenomenon of an aging population in Taiwan.

From data published by the Human Resource Department of The Council for Economic Planning and Development, The Executive Yuan, one of the governmental branches, indicates that Taiwan will witness a gradual but persistent increase in the average age of its citizens as a result of the extension of the average life span of its population. The elderly population age 65 and over will increase from 1 million (5.2%) in 1986 to an estimated 2.32 million (9.8%) by the year 2010 [8]. Statistics released in 1999 revealed that the elderly population has increased to 1.81 million (8.2%) in the present year [15].

The increase in the number of older people is a general indicator of a country's scientific, technological, social and economic improvement [19, 40]. In the past several decades, the rapid development in knowledge together with the

radical progress in science and technology has accelerated the changes in society [40]. To successfully adapt to social changes, educators agree that learning is demanded throughout the cycle of life [3, 12]. As Knowles indicated, "Learning in a world of accelerating change must be a lifelong process" [23, p. 171]. Therefore, the growing number of older adults has brought the issue of education of the older adults to the attention of educators.

The concept of learning as a lifelong process is gaining credibility in recent years in Taiwan. In 1980, the Taiwan government set up the Welfare Law of the Aged, which specifies that participation for older adults in society, education, religion, and scientific research should be encouraged by organizations and institutions to enrich the spiritual life of older adults. Accordingly, the extended aspects of the Welfare Law of the Aged have been expanded to the development of educational activities which could make later adulthood more prosperous. The Social Bureau of the Kaohsiung City Government conducted a survey in 1982 to determine senior citizens' needs and desires toward further learning. The analysis of questionnaire data revealed that 66 percent of older Taiwanese adults were considerably interested in involvement in educational activities. The learning aspirations of older people are distinct, and it is incumbent on the Taiwan government to cultivate the learning aspirations.

Responding to the coming aging society, the first Evergreen College was begun in Kaohsiung City in December 1982, and the Taipei Evergreen College was established in June 1983 [37]. Currently, 20 other cities and counties have joined the Evergreen College network in offering educational programs for persons age 55 and over[38]. A few programs offered focused on literacy education of which the Evergreen College is the chief provider. When the Evergreen College first established, the emphasis was on social welfare not on education. Programs were offered mostly in leisure and entertainment. Since December 1982, the Evergreen College has become the leading provider of educational activities for older people in Taiwan [42]. Due to the traditional youth and occupational orientation, the higher education institutions have never responded to the learning needs of the aging Taiwanese. Evidence confirms that Taiwanese older people are getting ready for higher education; whereas, they are healthier, better educated, and exposed to more educational opportunities than previous cohorts.

Elderhostel is an example of an extremely successful residential program hosted by universities and colleges in both the United States and Canada. Elderhostel was developed for adults 55 years or over who like to have new experiences and adventures in knowledge or social activities in their later years. Researchers have suggested using Elderhostel as a model in planning programs, but research was needed to understand whether the Elderhostel concept would attract the older people in Taiwan.

2 Statement of the Problem and Purpose

The increasing potential for a longer life and the need to cope with rapid social change have made it important to understand lifelong learning as a necessity for participation in today's world. The development of adequate educational programs in meeting older people's needs is the primary factor associated with this condition. Much of the information offered about the educational activities of older adults has been produced in the field of literacy education and older adult participation [19, 27, 28, 42]. However, there are limited studies that provide information on older adults as a community of learners in higher education settings.

Although education for older adults has received increased attention in the 1980s, no evidence indicates that older people have been considered as potential clientele by higher education. According to Liou [28], universities have not responded to the needs of older people because of their conventional youth and occupational orientation. Consequently, it is also not likely that older adults will actively participate in higher education. Therefore, the field of education for older adults has not evolved in higher education. Moreover, institutions that accept adult students into the traditional college environments are usually satisfying administrative convenience rather than meeting students' needs [28]. An institution must gain insight from the nontraditional students (age 25 plus), recognize their special interests and accommodate their unique needs to juggle the responsibilities of family life and work [9, 17, 29].

Given that aging Taiwanese are increasingly likely to participate in educational activities [28, 38, 40], program planners need to be able to speculate what kinds of programs will attract and serve this audience. One aid to prediction

is the inspection of existing successful programs. It is suggested by Kaplan that "...other groups will use Elderhostel as a model in planning programs to meet these student needs. The implications are many in terms of expanding colleges and universities to integrate elders into the university system" [22, p. 43]. The Elderhostel concept works well in the United States and Canada, but it is not yet known whether the Elderhostel concept will attract the older people of Taiwan.

The purpose of this study was to determine the attitudes of older adult students enrolled at the Taipei Evergreen College toward the Elderhostel program and to examine the possibility of using the Elderhostel model of residential educational programs for Taiwanese older adults. Two research questions were investigated: a) Are older Taiwanese adults' attitudes toward the Elderhostel program influenced by the demographic variables in terms of gender, age, health status, household income, occupation possessed, level of education, with whom they reside, marital status, and retirement status?; b) What is the possibility of using the Elderhostel model of residential educational programs for Taiwanese older adults?

3 Significance of the Study

The composition of population of modern society is aging daily, and the problems of the aged rise correspondingly [19]. According to a report of the Council for Economic Planning and Development in 1991, the percentage of citizens above age 60 will gradually increase from 5.2 percent in 1986 to 8.7 percent in the year 2000. A liberal estimate indicated that the percentage will increase to 9.8 percent which represents an 83 percent increase by the year 2010. These trends suggest that an aging society is inevitable in the future of Taiwan, the Republic of China [15, 40]. Each advanced country has attempted various strategies in working with the aging society. Acordingly,it is pressing for Taiwan to establish a more thorough social welfare agenda based on the needs of older people and to serve the aged by enriching their spiritual life with educational activities.

Education has traditionally been defined in terms of formal schooling [2]. However, an educational philosophy, lifelong learning, is reforming the way Taiwanese people think of education and the way educators think of their mission, which is that learning is a continual, lifelong process, not one that stops at adolescence [39]. Lifelong learning emphasizes the complete development of one's life span, education for the period between birth and death [3, 11, 19]. Although each individual's developmental stages are different, people have educational needs at every developmental stage [34]. Reed [35] stated, "Only recently has the realization surfaced that myriad changes are faced in the later years of life which learning can address" (p. 1). Education is one way of keeping abreast of the world and maintaining a healthy attitude on life.

Under the influence of lifelong education, programs for the aged are being considered by higher education in many developed countries [28]). In Taiwan, owing to its youth orientation, the population served by the university has not been expanded. According to [42], however, Taiwanese older people are getting ready for higher education. They are healthier, better educated, and exposed to more educational opportunities than previous cohorts. Most research with the elderly in Taiwan concerns psychological adjustment, health care, and mental and physical status. In 1985, an academic research meeting was held by the National Science Council, Executive Yuan, with Professor Huang, Kuo-yen as the convener [42]. According to Wu, the primary purpose of this academic research was to study the problems of the aged in the following four aspects: medical treatment, social economics, social welfare, and psychological education. Nevertheless, the emphasis of psychological education is still on psychological adjustment not on learning and education. Therefore, there is a gap in the Taiwanese literature concerning learning and education of older adults. The significance of this study was discussed in relation to an aging society, lifelong learning, educational needs of older adults, and research. Hence, it is hoped, the results of this study will provide a basis for making recommendations for future development of educational programs in higher education in Taiwan.

4 Subjects, Instrument, Pilot Study, Data Collection and Analysis

The study population was comprised of 1,124 adults age 55 and over who participated in the Taipei Evergreen College in 1997. However, due to the absence of 103 students the actual number of participants in this study was 1,021. The

demographic characteristics of participants were identified. Since females outnumbered males, housekeeping was most often indicated as an occupation. Most of respondents were 65 to 69 years of age, married, healthy, fully retired, possessed a college degree, and were living with spouse with a monthly income between NT$ 30,000 to NT$ 39,999.

Data were collected with a questionnaire which consisted of 29 questions, which were factors that influence and limit participation in the Elderhostel program, plus personal information. The survey instrument used in the present study was adapted from an instrument developed by Ostiguy [32]. According to Ostiguy, face validity of the original research instrument was determined by having the instrument screened by a panel of five experts. Three additional questions related to accommodations were selected by the researcher from the basic model of the Elderhostel program [1, 18, 24, 31]. Accommodations was often mentioned as one of the major considerations of choosing the Elderhostel as an educational setting for learning [3]. Therefore, adding three questions on accommodations was validated by the literature. The face validity of the modified research instrument used in this study was addressed during the pilot test and by having it screened by the four committee members. A pilot study was conducted with six older Taiwanese adults to assure that they could understand the concept of the Elderhostel program and to validate the survey instrument. The questions could be completed in ten minutes after incorporating suggestions from the pilot study group.

The tests of reliability of the survey instrument were conducted for all the respondents as a whole and were conducted separately by gender. All the tests yielded high alpha coefficients for the first set and the second set of questions on the instrument. The high Cronbach's alpha coefficients indicated a strong degree of internal consistency on both reasons that influence potential participation and factors that limit potential participation. The survey instrument was, then, verified to be sufficiently reliable. The researcher obtained permission to work with Taipei Evergreen College. She personally administered the survey to all classes over an eight-week period. Since the public was not informed about the Elderhostel program, the researcher gave a short presentation about the Elderhostel program and showed a ten-minute video before administering the survey.

A demographic profile of participants was generated by calculating frequencies and percentages. Eighteen ANOVA tests were conducted to examine the potential participation and non participation by the demographic variables to determine significant differences among group means. Reasons and factors that influence and limit participation were ranked by means and standard deviations to identify participants' preferences toward the Elderhostel program.

5 Research Question One

The Taipei Evergreen College students' attitude toward the Elderhostel program was significantly influenced by two demographic variables in terms of gender and health status. No significant differences were found with age, household income, occupation, level of education, with whom they reside, marital status, and retirement status.

Discussion

The present study revealed that females and males differed significantly in potential participation in the Elderhostel program. Females were more likely to participate in the Elderhostel program than males; therefore, gender was identified as an indicator of potential participation in the present study. This finding is inconsistent with Ostiguy's [32] study with Canadians which indicated no significant difference between female and male non-participants on both reasons and factors that influenced and limited potential participation. Edlow's [16] study with people participated in the Iowa Elderhotel program revealed similar results as the present study.

The attitudes of the respondents in this study were substantially different in non-participation based on health status. Respondents who were healthier demonstrated a stronger interest in the Elderhostel program than those who were not in good health. Health status was also identified as an indicator of potential participation. This finding supports studies by Brady [4], Brady and Fowler [7], and Ostiguy [32] which reported that potential participation was highly influenced by perceived health.

There were no significant differences found in potential participation and non-participation in the Elderhostel program based on age, household income, occupation possessed, level of education, with whom they reside, marital status, and retirement status. Ostiguy's [32] study also found significant difference on formal educational attainment and level of life satisfaction.

6 Research Question Two

The older adults enrolled in the Taipei Evergreen College tended to be interested in the Elderhostel program. Reasons related to learning were identified as the most important reasons that influenced participation for both female and male respondents. The majority of respondents felt that the factors presented in each of the statements did not limit their participation. Nevertheless, the respondents in this study indicated that the length of the program, the time program offered, and accommodations were the first, second, third factors in the list. It was concluded that the Elderhostel program was applicable to Taipei Evergreen College students but needed to be modified as suggested in the implications.

Discussion

The respondents of this study were intrinsically a group of lifelong learners. It is not surprising that they displayed an interest toward the Elderhostel program. The demographic profile of the respondents was similar to the characteristics of Elderhostel participants that were specified by many studies [1, 4, 5, 6, 16, 24, 25, 31, 32, 33, 36]. The typical participant was a female, married, in good health, well educated, financially stable, was employed and now retired.

Both female and male respondents indicated reasons related to learning as the most important reasons that influenced participation. The results of this study support the findings of Ostiguy's [32] study which suggested that reasons related to cognitive interests were at the top of the list of reasons influencing participation. This may be elucidated by the high education accomplishment level of the respondents. Many other studies [3, 10, 13, 16, 36] also indicated cognitive interest as a significant reason for older adults to enroll in the Elderhostel program. However, in this study, social reasons were additionally found to be important reasons that influenced male respondents' participation. Studies also indicated social needs as the important reasons for older adults, without specifying gender, to participate in the Elderhostel programs [3, 10, 13, 32, 36]. The least important reasons influencing potential participation in the Elderhostel program identified by the female and male respondents were reasons related to escaping from life's stresses and learning new skills for leisure purposes. This finding is supported by previous studies [3, 13, 32] which indicated that escape, the need to get away or take a break, was not a major reason of participating in educational programs.

According to the findings, both female and male respondents of this study reported problems with leaving home too long, living in a dormitory room, and sharing a room with others. Male respondents also indicated one different factor, do not have time. Leaving home too long was also indicated as one of the major problems in Ostiguy's [32] study. Accommodations were often mentioned as an important factor affecting older adults' decisions to participate in the Elderhostel program [3].

7 Implications for the Taipei Social Bureau

1. To live with the escalating pace of change, lifelong learning becomes a necessity for everyone including the elderly (Cross, 1981). Currently, only a few educational programs are provided especially for older people in Taiwan. As the number of older Taiwanese adults increases, so does the need to offer more educational activities to meet their learning needs. According to the findings, the respondents seemed to be very interested in taking part in the Elderhostel program. It is recommended that the Taipei Social Bureau affiliate with universities and colleges to offer an educational program which is designed based on the basic model of the Elderhostel program. It must be noticed that the name Elderhostel is a registered service mark in both the United States and Canada, and permission is needed for using the name [14, 16, 24, 35].

2. The programs offered by the Evergreen College are mainly for leisure and social purposes [42]. The findings indicated that the most important reasons that influenced the respondents to engage in Elderhostel were reasons related to acquiring new knowledge. The Taipei Social Bureau needs to remain true to the nature of Elderhostel which is to offer programs related to the cognitive skills (liberal arts) when designing the program.

3. In a typical Elderhostel program participants live in university dormitories and take three courses during one week [1]. There have been exceptions to the model when some Elderhostel programs lasted less than one week while some lasted more than one week. Some host institutions lodged hostelers at comfortable hotels instead of university dormitories [18]. In this study, leaving home too long, living in a dormitory room, and sharing room with others were indicated as problems by the respondents. Based on the findings, adjustments of the length of the program and accommodations should be made more appealing to older Taiwanese adults.

4. In the present study, females were found to be more likely to participate in Elderhostel than males. However, both females and males were likely to participate in the Elderhostel for the sake of learning. It is recommended that the Taipei Social Bureau should offer courses that are truly appealing to older female and male adults. A needs assessment, therefore, is essential to decide what courses in the domain of cognitive should be offered.

5. According to the findings, respondents who were healthier reported a stronger interest in Elderhostel than those who were not in good health. Given 240 (39.4%) respondents were not in good health, it is recommended that the Taipei Social Bureau ensure and strengthen the supplementary services at program sites, such as health, transportation, or counseling.

6. Elderhostel is designed for older adults of all educational levels. However, according to the demographic profile, 195 (32.7%) of the respondents reported college experience. Those with better education may desire to seek an advanced learning opportunity than someone with a lower level of educational attainment. Since the reason, to learn something new, was identified as the most important reason for participation, it is recommended that opportunities for optional advanced study become part of each course.

7. To understand the educational needs and interests of older Taiwanese adults, it is recommended that the Taipei Social Bureau continue to fully support research investigations. The Taipei Social Bureau should consider initiating a research fund to assist the endeavor of expanding understanding of older learners.

8 Implications for Future Research

1. The population of this study was limited to older adults enrolled in the Taipei Evergreen College. The results, therefore, are not appropriate to be generalized to the population of all older Taiwanese adults. A more heterogeneous population with ample variety in demographic background should be taken into consideration. It is recommended that future studies replicate this study with a greater sample size in all the geographic areas in Taiwan.

2. This study is the first investigation concerning using Elderhostel as a model to develop new educational programs for older Taiwanese adults. To be deliberate, further research is needed to examine the results of this study and to provide additional comparative data.

3. A valuable research problem which was not included in this study is the investigation of the other indicators of potential participation and non-participation, such as geographic area, self or familial experience in adult education, and first participation in adult education at what age. Future studies are needed to examine what specific factors can be used to predict potential participation and non-participation.

4. In order to increase educational opportunities for older Taiwanese adults, the investigation of the intention of universities to cooperate with the Taipei Social Bureau in providing new educational programs is in demand. Programs designed based on the Elderhostel model would be appropriate due to the strong interest toward the

Elderhostel program indicated by the respondents. Owning to the unique tradition and culture of each university, a qualitative research approach would be appropriate to provide an in-depth explanation of the intentions of the 45 universities in Taiwan.

References

[1] Abraham, S. C. (1992). A study of the satisfaction of participants in university administered Elderhostel programs as related to selected personal variables (Doctoral dissertation, the University of Texas at Austin). Dissertation Abstracts International, 53, 0916.

[2] Academy for Educational Development (1974). Building a bridge between lifelong and learning. Taipei: Taiwan.

[3] Arsenault, N., Anderson, G., & Swedburg, R. (1998). Understanding older adults in education: Decision-making and Elderhostel. Educational Gerontology, 24, 101-114.

[4] Brady, E. M. (1982). Selected correlates of participants' perception of growth in Elderhostel programs (Doctoral dissertation, The University of Connecticut, 1982). Dissertation Abstracts International, 43, 3673.

[5] Brady, E. M. (1983). Personal growth and the Elderhostel experience. Lifelong Learning, 7, 11-13.

[6] Brady, E. M. (1984). Demographic and educational correlates of self-reported learning among older students. Educational Gerontology, 10, 25-38.

[7] Brady, E. M., & Fowler, M. L. (1988). Participation motives and learning outcomes among older learners. Educational Gerontology, 14, 45-56.

[8] Council for Economic Planning and Development. (1991). ROC 1986-2010 year Population Inferential Statistic.Taipei, Taiwan: The Executive Yuan.

[9] Covey, H. C. (1982). Preliminary findings on designing higher education programs for older people. Educational Gerontology, 8, 463-471.

[10] Covey, H. C. (1983). Perceptions of activity and participation in the college student role by older people. Educational Gerontology, 9, 463-469.

[11] Cross, K. P. (1981). Adults as learners: Increasing participation and facilitating learning. San Francisco, CA: Jossey-Bass Inc.

[12] Cross, K. P. (1982). Older adult and higher education (GPO Document Service NO. HE 23.3003.OL) Washington, D.C.: National Council of Aging.

[13] Danner, D. D., Danner, F. W., & Kuder, L. C. (1993). Late-life learners at the university: The Donovan Scholars program at age twenty-five. Educational Gerontology, 19, 217-239.

[14] Davidson, R. (1986). The Elderhostel experience in Pennsylvania (Doctoral dissertation, Columbia University Teachers College, 1986). DissertationAbstracts International, 47, 1981.

[15] Directorate-General of Budget, Accounting and Statistics, Executive Yuan. (1999). The evidence of aging population [On-line]. Available: http://www.dgbasey.gov.tw/dgbas03/bs7/report/87/07.htm

[16] Edlow, M. D. (1983). Motivational orientations of participants in Elderhostels (Doctoral dissertation, Iowa State University, 1983). Dissertation AbstractsInternational, 44, 1712.

[17] Edwards, B. & Marullo, S. (1999). Editor's introduction: Universities in troubled times–institutional responses. The American Behavioral Scientist; Thousand Oaks, 42, 754-761.

[18] Elderhostel United States and Canada Catalog (1997). Boston, MA: Elderhotel Inc.

[19] Huang, Fu-Shuenn. (1990). Taiwan's adult education: The current situation and future trends. Societal Education, 20, 37-60.

[20] Jan, Mei-jiuan. (1994). Learning preference among non-traditional students in higher education: A comparison with traditional students. Unpublished master thesis, National Taiwan Normal University, Taipei, Taiwan.

[21] Kaohsiung Social Bureau. (1982). Adult education convention. Kaohsiung, Taiwan: Educational Expansion Department.

[22] Kaplan, M. (1982). Elderhostel: Any college can (Master thesis, San Francisco State University, 1982), Master Abstracts International, 46, 2571.

[23] Knowles, M. (1990). The adult learner: A neglected species (4th ed.). Houston, TX: Gulf Publishing Co.

[24] Knowlton, M. P. (1977). Liberal arts: The Elderhostel plan for survival. Educational Gerontology, 2, 87-93.

[25] Larsen, D. C. (1983). The Illinois Elderhostel program: Its evolvement operation, and 1982 Summer student characteristics (Doctoral dissertation, Southern Illinois University at Carbondale, 1983). Dissertation Abstracts International, 44, 2014.
[26] Lin, Mei-Jen. (1988). The Chinese grandparent in three generation household in Taiwan (Doctoral dissertation, Northwestern University, 1988). Dissertation AbstractsInternational, 49, 3325.
[27] Lin, Mei-Ho. (1989). New research subjects of older people'sproblems. Taipei: Gwo-Chang.
[28] Liou, Lin-Tzy. (1992). Adult education and higher education. Unpublished master thesis, National Taiwan Normal University, Taipei, Taiwan.
[29] Moore, M. L., & Piland, W. E. (1994). Impact of the campus physical environment on older adult learners. Educational Gerontology, 20, 129-138.
[30] National Taiwan Normal University,(1990). New Research Subjects of Older People's Problems. Taipei, Taiwan: Department of Societal Education.
[31] O'Donnell, K. M., & Berkeley, W. D. (1980) Elderhostel: A national program. New Directions for Higher Education,29, 97-102.
[32] Ostiguy, L. J. (1993). Identification of factors that influence participation and non participation in Elderhostel programs (Doctoral dissertation, the University of Iowa, 1993). Dissertation AbstractsInternational, 55, 0448.
[33] Patterson M. F. (1988). An analysis of the Elderhostel experience at one university. (Doctoral dissertation, North Texas State University, 1988). DissertationAbstracts International, 49, 2898.
[34] Peterson, D. A. (1983). Facilitating eduation for older learners. San Francisco, CA: Jossey-Bass Limited.
[35] Reed, N. J. (1992). Characteristics of successful long-term Elderhostel programs across diverse sites (Doctoral dissertation, University of Georgia, 1992). Dissertation Abstracts International, 53, 2208.
[36] Romaniuk, J., & Romaniuk, M. (1982). Participation motives of older adults in higher education: The Elderhostel experience. The Gerontologist, 22, 364-368.
[37] Taichung Social Bureau. (1990). Education of SeniorCitizens. Taichung, Taiwan: The Ministry of Education.
[38] Trends of adult education in 1997. (1996, December 1). Central Daily News, p. A8.
[39] Tsai, Pei-tsuen. (1998a). Adult Education and Career Development. Kaohsiung, Taiwan: Li-Wen Publishing Co.
[40] Tsai, Pei-tsuen. (1998b). Learning and Career Development for Older Learners. Kaohsiung, Taiwan: Li-Wen Publishing Co.
[41] Unparalleled opportunities abound with the Elderhostel program. (1999, April 18). Fifty Plus, p. 2.
[42] Wu, Wan-Chen. (1992). Older adults' educational needs: A relationship with demographic variables. Unpublished master's thesis, National Taiwan Normal University, Taipei, Taiwan.
[43] Yang, Chu-Yin. (1992). The aging: A great potential human resource of Taiwan. International Review of Education,38, 427-446.
[44] Zoller, D. M. & Long, H. B. (1995). Outcomes of Elderhostel participation. Educational Gerontology, 21, 113-127.

CedarLearning: The Development of Learner-Centred Environments

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Royal Roads University (RRU) is a four year old University situated on a 640 acre historic site featuring beautiful grounds and a nineteenth century castle. The mission of the University is to deliver world-class applied and professional programs to Canadian and international adult learners. RRU's degree programs are designed for the mid-career professional and its graduate programs combine periods of on-campus instruction and semesters of distance education. This delivery model (a) aligns with the needs of mid-career professionals, and (b) is dictated by the size of the physical buildings at RRU; currently only 250 learners can be accommodated on-campus at any one time. At RRU's Centre for Economic Development and Applied Research (CEDAR) we have developed tools that allow simultaneously for both knowledge-building, collaborative learning and for individual, self-paced learning in the same course. This flexibility provides the opportunity for just in time and just enough information that creates the truly learner-centred environment. These tools are used in several of the MBA courses, such as finance and e-commerce.

Keywords: **Knowledge Construction and Navigation, Lifelong Learning, Web-Based Learning**

1 Introduction

Royal Roads University (RRU) in British Columbia, Canada is a five year old University situated on a 540 acre historic site featuring beautiful grounds and a nineteenth century castle. For 40 years the facility was used as a campus for Military officers, and became a public University when the Department of National Defense closed the facility and leased the space to the Province of British Columbia.

Although beautiful and steeped in history, The physical facilities limit the on-campus population to only 325 students at any one time. This forced the University to explore alternate delivery methodologies from the very beginning, and has resulted in an innovative and highly effective model that targets mid-career learners.

The University focuses primarily on Masters level programs which are offered at a distance to learners who are still in the workforce and continuing at their jobs. These students come together for a series of brief residencies and complete the remainder of their degree through Web-based distributed learning.

With busy mid-career learners, several issues had to be addressed. In addition to accommodating the usual issues of time and place, the University wanted to adopt a Learner-centred approach that would adjust for such variables as prior learning level; Learning Styles and use of granular knowledge objects. At the same time, designers were cognizant of the significant body of research evidence that points to learning communities and collaborative discourse as critically important components of any online courseware.

The resulting courseware seemed to effectively combine the best of the highly learner-centred techniques used in private sector training with the collaborative techniques that have proven effective in most successful post-secondary online courses.

Using commonly available web development tools the team at Royal Roads University created courses that are database-driven, and use dynamic templates to easily populate and modify course content. They devised a number of online assessment and feedback tools, as well as innovative "jig-saw puzzle" style group assignments to stimulate collaboration. They developed a navigation system to allow learners a choice of delivery styles to suit personal learning style preferences, and a self-assessment mechanism to help learners move through online material on a need-to-know basis.

Additionally, the system provides easy management tools for the instructors to control and modify content, as well as monitor the students' progress, without needing any knowledge of web page creation or HTML.

The development team at Royal Roads University is part of the Centre for Economic Development & Applied Research, (CEDAR). They are continuing to explore and evolve the understanding of what works and what doesn' t in online learning. At RRU, the team is fortunate to have a "live" laboratory of more than 900 active online students, and a University-wide commitment to Web-based delivery.

In this presentation, we will demonstrate actual delivered courses, present our findings, and demonstrate our course design. We will show how the use of templates and database driven content allows course designers to adjust for variables of learning style, prior knowledge, and level of effort, in addition to time and place.

CEDAR' s methodology is applicable to all forms of electronic distributed learning (EDL) regardless of the delivery mechanism – distance education or classroom delivery, over the Internet or via CD-ROM, instructor-led or instructor-free. Learner-centred EDL courses can be easily designed using commercially available software tools. These tools allow simultaneously for both knowledge-building, collaborative learning and for individual, self-paced learning in the same course. This flexibility provides the opportunity for just in time and just enough information that is demanded by busy professionals seeking a learner-centered environment. These learners have a lifetime of experiences and want a course that is tailored to their needs and takes advantage of their prior knowledge.

Our methodology allows learners to navigate through the content according to learning style. Pre-testing on learning outcomes allows for prior learning assessment, adaptive self-assessment quizzes provide feedback, and technical assistance is built into the course. On-line communities are created through group jigsaw assignments and forum discussions. This allows learners from diverse backgrounds to participate in an on-line environment that is geared to their individual needs.

Some of our unique features include:

1. Learner-centred approach allows learners to navigate throuth the material based on their preferred learning style. This is in contrast to most EDL courses which follow a sequential text-book like approach,
2. Learners can pre-test for prior knowldege. This saves them time as they study only those parts of a course that they do not already know,
3. Self-assessment quizzes allow learners to monitor their progress throughout the course and review as needed,
4. The outcomes-based design of the database allows for the use of shareable courseware objects for different learning needs in different courses.

2 Design and Development of the E-Commerce Course

The development process began with the course designer showing the instructor previously completed courses. By seeing exemplars the instructor was presented with different teaching options that the technology facilitates and allowed the instructor imaginative application of the construction process. (integrating real world/live data, interactive diagrams, and animated examples).

The design and development of the e-commerce course was a three-way communication between the content expert, an instructional designer (who is a specialist in learning styles) and the technical designer. The instructor was actively involved in the course development and provided the learning outcomes for the course. The instructional designers established the appropriate navigation for the different Learning Styles and those navigation methodologies were then tagged into the database templates.

The Web based Discussion Forums were setup and the instructor was given early access. The course

underwent a period of testing before the students were given access and any noticeable glitches were corrected at that time.

3 Student Engagement

Instructional materials are delivered to distance-learners via the Internet or to classroom-based learners via CD-ROM. The primary thrust behind the methodology was to produce courseware that is truly learner-centred rather than content-driven or instructor-centred. The course material is navigated in a variety of database-driven, learner-selected methods, depending upon individual preferences. Students also have access to a 24-hour online support available for any technical problems that they may experience. PDF files or screen prints are available for offline browsing of the course content.

Each course module has a number of self-assessment questions, which allows the learner to measure themselves against the desired learning outcomes for that granule. A learner may choose to try this assessment before working through any of the material, or afterwards for self-formative evaluation of the module content. At the end of the assessment, the learner is informed which areas of the module require study. Learners returning later to the self-assessment questions are asked questions only on those areas incorrectly answered the first time.

The web application allows the learner to optionally take a learning style test that provides information about their preferred learning style. After completing the test, the individual is provided with information about their preferred style and each unit can be approached according to that style. Users can switch freely between styles at any point.

To enhance critical thinking and process skills, and the development of community, the courses have included:
(a) residency,
(b) group jigsaw assignment,
(c) case-based reasoning,
(d) electronic forums, newsgroups and live chat
(e) peer to peer and self evaluation
(f) real-world, just in time articles for on-line discussion,
(g) instructor acting as a guide on the side and not as a sage on the stage.
(h) Integration of real-world projects.

These opportunities provide for (a) immediate transferability to the workplace, and (b) building a knowledge network that extends long beyond the end of the degree program.

4 Lessons Learned

The results of the project were gathered from learners through formative feedback, summative evaluation, and focus group discussions.

In general, it was found that learners reacted positively to
(a) the different navigation styles for the four learning styles,
(b) the look and feel of the user interface
(c) the on-line technical helps,
(d) the internal consistency of links,
(e) the ability to pre-test prior knowledge,
(f) the on-line immediate feedback given in the self-assessment quizzes
(g) collaborating with their peers at a distance, and jigsaw style assignments.
(h) the flexibility of doing the course at a convenient time and place.

Some learners relied heavily on offline reading of the printed material, particularly those with poor connectivity or minimal familiarity with computers.

Some complained that the course required them to do too much on the computer, and they would have

preferred more offline work.

Very technically literate students suggested more use of multimedia in the content. In the finance course, several exercises required the student to use a separate spreadsheet, and it was felt that this functionality should have been incorporated into the online exercise. This can be easily done with the technology that was used.

Some saw the self-assessments as more threatening, (they carried no marks) while most saw them as a tool.

Some suggested allowing the student to mark up the content online, such as with the use of electronic "sticky notes". This suggestion will be implemented in the next course.

Three main lessons that we have learned from this project are:

1. It is possible to produce EDL courseware that is learner-centred and not content-driven or instructor-driven. This results in more satisfied learners who feel that their time, prior knowledge, and learning preferences have been considered,
2. Using off-the-shelf tools save on production time and costs and ensure that tried-and-tested software is utilized,
3. Courses that are database-driven provide opportunities for re-using data elements in different courses.

Design and Implement CAI Programs for Adult Literacy Learners

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This paper discusses adult learners' learning characteristics and how to integrate their characteristics with proper learning theories to make the CAI design more appropriate for adult learners. Three important issues concerning CAI design features are discussed: (1) learner control, (2) feedback and reinforcement, and (3) cooperative learning. Suggestions for CAI software designers about CAI design features and for adult literacy educators in implementing CAI programs are provided at the end of the paper.

Keywords: **Computer-Assisted Instruction (CAI), Adult Literacy Education**

1 Introduction

The computer has been attracting adult literacy educators' attention because it provides solutions to problems which have been plaguing adult education. For instance, it allows self-directed learning. Privacy is also possible. In addition, it provides flexible scheduling for adult learners. However, several limitations exist. One of the biggest problems with computer-assisted instruction to adult literacy education is the lack of CAI designed to meet the specific needs of adult learners. This paper discusses learning characteristics of adult learners, issues concerning CAI design features for adult literacy learners and provides suggestions for computerized adult literacy education.

2 Adult Learners' Learning Characteristics

Summarizing many adult educators' findings about adult learners' development and learning, the author generated a list of learning characteristics of adult learners. (1) Self-motivated: adults have a self-concept of being responsible for their own decisions and for their own lives. They want to be involved in making mutual decision about the learning process. (2) Experienced: adult learners want the learning experience to relate to their real-world experiences. (3) Practice-oriented: adults learn better by really doing something rather than hearing theory only. (4) Pragmatical: adults need to know exactly what the learning objectives are and how they will apply them in their daily lives. (5) Self-evaluated: adults like to know how they are progressing, but they tend to shy away from tests because of the fear of being humiliated if they do not do well. (6) Varied learning style: adults have adopted a particular learning style and it is not easy to change it. Thus adults want a variety of learning techniques utilized.

3 Issues Concerning CAI Design Features for Adult Literacy Learners

Learner control is particularly important for adult learners for three reasons: (1) adults need to control their learning, (2) they may need more time to make decisions about the learning topics and procedures, and (3) their learning may be ineffective in a learning situation with speed constraints [7].

Researchers have suggested effective instructional materials for adult learners should include feedback and reinforcement [2, 7, 9]. Chen [4] also asserted that positive and explanatory feedback had significant positive effects for adult learners' achievement and attitude toward instruction.

The rich resources of each adult's unique experiences and differing contexts should be focused on and integrated into the learning environment [11]. Steeples [11] concluded that, "Learner collaboration not only emphasize a positive, constructive approach to learning but it also allows the knowledge and skills of the participants to be shared with their peers and with others who have similar interests and concerns" (p. 452).

4 Suggestions

1. Design CAI for knowledge application. CAI for adult literacy education is still limited to specific learning subjects, such as language and mathematics. However the final goal is for the individual to be able to apply these skills to meet the needs for dealing with daily life. CAI designers should expand adult literacy learning subjects from the basic knowledge level to the advanced application level.

2. Develop daily-life-related simulation programs. To expand learning subjects from the basic knowledge level to advanced application level, a more complex learning environment is needed. A daily-life-related program could simulate real world environment, such as food markets, banks or hospitals, and allow learners to experience and solve problems happening in daily life. A tutorial section might also be integrated with the simulation program to provide instruction whenever needed.

3. Apply advanced computer technology. A simulated real environment can be displayed in a video segment or a Quick Time movie. The learner uses the computer to control the video to playback and retrieve information needed to solve the problems presented in the computer. A daily-life-related simulation program delivered by a multimedia system would motivate adult learners and improve their achievement.

4. Consider adult learners' vocabulary ability. Instructional developers must understand adult learners' vocabulary ability and develop easy-to-read text for adult learners improve their literacy ability in a progressive way. An option for audio to explain program usage methods and important information in plain daily-life language should be provided.

5. Develop CAI for both cooperative and individualized learning environment. When designing CAI software, neither individualistic nor cooperative learning should be viewed as the ultimate delivery system for adult literacy education. CAI programs that can be implemented in both individualized and cooperative learning environments would be more practical and effective for adult literacy learning.

6. Integrate varied software interactivity. The interactivity level of CAI should be carefully determined and designed after considering learners' characteristics, subject matter, and learning outcomes. When drill-and –practice learning mode is needed to help learners master some specific skills, semi-interactive CAI software might be a good design approach. If the learning outcomes are advanced knowledge application, CAI which provides high level of interactivity would be needed.

7. Apply multiple media with adult literacy teaching activities. When a learning environment provides varied learning media to facilitate students' learning, it is called a multimedia learning environment. If a computer-controlled multimedia is not available, adult literacy educators are encouraged to create a human-controlled multimedia learning environment for learners.

8. Let learners decide to learn individually or cooperatively. CAI designers are suggested to develop CAI which can be implemented in both individualized and cooperative environments. Adult literacy educators are also encouraged to let learners decide their CAI learning strategies. Learners can choose to learn individually, in pairs, or in groups of more than two.

9. Help learners obtain positive attitudes toward using computers. Teachers or trainers should avoid jargon when explaining how to operate a computer and access CAI program. Adult education organizations should offer a short pre-training program to help learners orient themselves to a computerized learning environment. Finally, adult learner grouping should pair learners who have never used computers before with learners who have had some computer experience.

10. Provide flexible learning schedule and learning location. CAI adult literacy educators should provide adult learners, who usually have many different obligations, with flexible learning schedule and choices of learning locations when implementing CAI programs for adult learners. This special feature of CAI—always providing organized and uniform instruction—should be fully used and enjoyed by adult learners.

References

[1] Askov E. N., & Brown, E J., "R.O.A.D to success: Evaluation of workplace literacy efforts", Adult Basic Education, Vol 2, No. 3, pp. 167-175, (1992).

[2] Askov, E. N., & Clark, C. J., "Using computers in adult literacy instruction", Journal of Reading, Vol 34, pp. 435-448, (1991).

[3] Boucouvalas, M., & Krupp, J., "Adult development and learning", in S. B. Merriam & P. M. Cunningham (Eds.), Handbook of Adult and Continuing Education (pp. 183-200). San Francisco: Jossey-Bass. (1989).

[4] Chen, P. C., "The effectiveness of computerized adult literacy education: a meta-analysis of literature from 1979 to 1994", Unpublished Ph.D. dissertation. Purdue University, West Lafayette, Indiana, (1996).

[5] Ewing, J. B., London, J., & Ramirez, S., "Adult education and computer literacy: A new challenge", Lifelong Learning, Vol 10, No. 3, pp. 21-23, (1986).

[6] Fletcher-Flinn, C. M. & Gravatt, B., "The efficacy of computer-assisted instruction (CAI): A meta-analysis", Journal of Educational Computing Research, Vol 12, pp. 219-242, (1995).

[7] Manheimer, R. J., "Older adult education: A guide to research, program, and policies", Westport: Greenwood. (1995)

[8] Merriam, S. B., "An update on adult learning theory", San Francisco: Jossey-Bass, (1993).

[9] Mills, H., & Dejoy, J., "Applications of educational technology in a self-directed learning program for adults", Lifelong Learning, Vol 12, No. 3, pp. 22-24, (1988).

[10] Shaw, D. S., "Computer-aided instruction for adult professionals: a research report"., Journal of Computer-Based Instruction, Vol 19, No. 2, pp. 54-57, (1992).

[11] Steeples, C. A., "Computer-mediated learning environment for adult learners: Supporting collaboration and self-direction", Journal of Educational Multimedia and Hypermedia, Vol 2, pp. 443-454, 1993.

[12] Woldkowski, R. J., "How to plan motivational strategies for adult instruction", Performance and Instruction, Vol 24, No. 9, pp. 1-6, (1985).

Empowering Secondary School Teachers to Effectively Exploit Internet Resources for the Enhancement of Teaching and Learning

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There are great potentials for the use of computers in the enhancement of teaching and learning in secondary schools, but in some subject areas, the realisation of these potentials is critically limited by the lack of appropriate educational software. Custom development of this kind of software is often not a viable alternative, since such a task is well known to be non-trivial and time-consuming that is frequently beyond the capacity of individual secondary school teachers. As computer science researchers and educators, we are aware that vast amount of teaching resources are freely available on the Internet. Such resources are often used by tertiary educators for enriching their teaching, but largely under-utilised by secondary school teachers. This paper reports our experience in the design and delivery of a short course which aims at refreshing practising secondary school computer teachers with updated knowledge on teaching and learning with computers. We describe how we achieve our goals of providing practical assistance to computer teachers by empowering them to effectively exploit Internet resources for use in their schools. Our approach is enabling in that it fosters participants' lifelong learning beyond the contents of the present course, and is applicable to a broader context than ours.

Keywords: **Teacher education, lifelong learning, program visualisation, algorithm animation**

1 Introduction

For a long time, educators and computer scientists have been exploring the use of computers in education [9]. The rapid drop in hardware price and the tremendous improvement in computing power in recent years have rendered computers more affordable to schools, teachers and students. Hardware is no longer the bottleneck that hinders the integration of information technology (IT) into the school curriculum. There are increasingly great potentials for using computers to enhance teaching and learning at all levels of education. In some subject areas, however, the realisation of these potentials is severely limited by the lack of appropriate educational software.

The development of good quality CAI software is well known to be a non-trivial and time-consuming task that calls for the combined expertise of programmers, experienced educators, graphics/multimedia designers, and others [10]. Such a task is often beyond the capacity of individual teachers in primary and secondary schools, due to their limited time, technical expertise and perhaps monetary resources. More fundamentally, it would not be realistic to require every teacher to develop their own CAI software from scratch for use. This is even true for most university educators. As Resmer [13] argues, "if every professor in a university had to write their own textbook, typeset it, print it, publish it, bind it, and distribute it before their students could use it, [textbooks] would not be a viable learning resource". Likewise, for widespread and effective use of computers in education, there is a need for teachers to be well informed of the source of available

educational software.

The Internet promises to be a source of many valuable teaching resources that are frequently available freely or at affordable costs. There are many advantages of exploiting Internet resources for use in teaching. Apart from cost savings, software tools on the Internet are more likely to be kept up-to-date as technology advances, and their evaluation versions could be put to trial use before making actual purchases.

By nature of their work, many university educators are accustomed to the exploitation of Internet resources for both research and teaching purposes [14]. In contrast, these resources have largely been under-utilised by secondary school teachers due to various reasons. Firstly, many teachers are not aware of the existence of such resources on the Internet. One example is the use of visualisation and animation tools that are great aids to program understanding. Although the existence and effectiveness of these tools have been well known to computer science researchers in the field, our experience is that few secondary school teachers are aware of this.[1] Secondly, teachers might not know where these resources are, even if they are aware of their existence. Blind searches on the Internet are likely to be inefficient and sometimes not productive, in terms of the time taken to retrieve useful materials. Thirdly, the use of some resources requires a level of technical competence that a typical secondary school teacher might lack. Finally, some software tools have to be adapted to suit the needs of individual teachers, and without any support or assistance, such tasks could be daunting.

In this paper, we report our experience in the design and delivery of a short course which aims at refreshing practising secondary school computer teachers with updated knowledge on teaching and learning with computers. We describe how we achieve our goals of providing practical assistance to computer teachers by empowering them to effectively exploit Internet resources. Our approach is enabling in that it fosters participants' self and lifelong learning beyond the contents of the present course. We believe that our approach is actually applicable to a broader context than ours and therefore would be of interest not only to secondary school computer teachers, but also to teacher educators and teachers of other disciplines at all levels.

The rest of this paper is structured as follows. Section 2 introduces the context and goals of our short course. Section 3 provides the background of the subject area: computer programming and visualisation tools. Section 4 describes how we exploit Internet resources for use in the course. Section 5 describes the implementation of the course and the feedback from participants. Section 6 discusses our approach. Section 7 concludes this paper.

2 The Teachers Update Course

2.1 Background and objectives

Our university has been organising the Teachers Update Course (TUC) annually as a service to local secondary schools. It aims at refreshing practising school teachers with updated knowledge on the subject areas they teach, and offering advice and assistance on the teaching and learning of the subjects. It serves to show our university' s concerns to secondary education, to share our professional expertise, and to promote communication and cooperation between our university and secondary schools.

TUC consists of a series of half-day short courses that encompass many subject areas such as Use of English, Mathematics, Computer Studies, Physics, and others. This paper reports our experience in the design and delivery of the course on Computer Studies. Participants of the course were mainly secondary school teachers of computer subjects such as Computer Studies and Computer Literacy.

2.2 The local secondary school context

In Hong Kong, school teachers are often heavily loaded with both teaching and non-teaching commitments. Typically, a teacher has to conduct six to seven lessons per day, each lesson lasting for 35-40 minutes. In

[1] One author of this paper previously taught a class of student teachers in a Postgraduate Certificate in Education programme who were major in Computer Studies, and none of them were aware of the existence of program visualisation and algorithm animation tools. Similarly, none of the practising computer teachers who participated in the Teachers Update Course described in this paper were aware of such tools.

addition to such work as lesson preparation, setting and marking tests and examinations, most teachers have to share school administrative work as well as leading students to participate in extra-curricular activities. In recent years, the Government of the Hong Kong Special Administrative Region (HKSAR) has undertaken numerous initiatives to promote the integration of IT into the school curriculum [3]. Since teachers of computer subjects are usually more acquainted with the use of computers than other colleagues, they are often busily involved in the setting up and management of the IT infrastructure of their schools, and they are generally expected to assist other teachers in solving various problems in using IT.

Increasingly, there are pressures for teachers of all subjects to apply IT in their teaching activities. Many teachers have to spend a great deal of time after school hours to attend in-service IT training courses [8,9]. However, one common problem they encounter is the limited availability of appropriate educational software, and few of them have the time and expertise to develop their own courseware. Moreover, budgets are limited in schools for the purchase or development of courseware.

2.3 Goals and strategy

During the planning and preparation of the short course on Computer Studies, the following goals were formulated in an effort to maximise the usefulness of the course to the participants:

- *The course had to provide materials that are directly relevant to teaching in schools.*

  The course in the previous year was intended to broaden the computer knowledge of school teachers by providing updated information on multimedia and their applications. As such, the course was organised in the form of a condensed lecture of part of an undergraduate subject, supplemented by demonstrations of the applied research work of our staff in the area. Although the subject materials were interesting, many teachers subsequently indicated a preference of topics that are more directly related to their own teaching in schools. Simply acquiring further knowledge in the computing field was not as welcome as knowing something directly useful for solving the problems they encountered in their teaching.

- *The course had to offer practical assistance to teachers.*

  Considering the heavy workload of secondary school teachers, any teaching resources must be easy to use and demonstrably useful, or they would not be used at all. In selecting the course materials, preferences were given to those that are easily and practically applicable in the secondary school context. This strategy is also in response to the feedback by teachers in the previous year of their desire to learn something that is "more relevant [to their teaching]".

- *The course should motivate teachers' interests and empower them to pursue further via self-learning.*

  The course was a short one and naturally limited in the amount of teaching materials we could possibly provide. Even with a much longer duration, it would still be impossible to inform the teachers everything they had to know about the topic. Moreover, even for the same topic, there are considerable variations in their needs (for example, due to different teaching styles or their students' background). The same technique useful to one teacher might not work for another. What is more important is to foster their ability to pursue the topics further beyond what we offer, whenever they have the need to do so. Therefore, from the outset the course was designed to "have an empowering or enabling effect on the participants" [9]. We hoped that the course could enable school teachers to acquire what they need via self and lifelong learning.

Setting the right goals was important, but the real challenge was how to achieve these goals within a few hours of contact with the participants. We now outline our strategy as follows. Firstly, we selected a topic that would likely interest most computer teachers: computer programming and algorithms. This topic is clearly directly related to their teaching. Secondly, we collected useful information and software tools for the enhancement of teaching and learning of this topic. Most of these resources were originated from overseas and would be hard to access were they not put on the Internet. Thirdly, among them, we selected only those information and software tools that were judged to be practically useful in the local secondary school context. Finally, we demonstrated to teachers how they could have found and utilised these resources on their own through the Internet.

In retrospect, we believe that although the first step (topic selection) is important in ensuring the relevance

of the course, it is our approach in the remaining steps (use of the Internet resources) that would have more profound influence to the participants. Our approach will be discussed in detail in Section 6. Meanwhile, we briefly introduce the subject area in Section 3 and then elaborate on what we did in the course in Sections 4 and 5.

3 Computer programming and visualisation tools

3.1 Computer programming as a common major part of many computing curricula

Computer programming and algorithms is usually considered a significant and fundamental component in undergraduate computer science education [6]. In most universities, introductory programming and the design of elementary algorithms are the first courses that a computing major undergraduate student has to take (unless these courses were exempted due to credit transfer or advanced standing). Elementary programming courses are also frequently offered as electives to non-computing students with a broad variety of backgrounds [10].

At the secondary school level, computer programming is historically the major component of a typical computer subject. Although the emphasis of learning programming has now been reduced as compared to the past, there is, arguably, still a place for it to be included in the secondary school curriculum. In Hong Kong, both the Computer Literacy subject (offered to almost all junior secondary students) and the Computer Studies subjects (offered as electives to senior secondary students) include programming as a major part of the curriculum [2].

3.2 Difficulties of teaching and learning computer programming and algorithms

The teaching of computer programming and algorithms presents a great challenge to educators at both the secondary level and the tertiary level [15]. To understand a computer program or an algorithm, the student needs to have a good understanding of the internal execution model of computers, as well as the dynamics of variables, data structures and control flows in the algorithm [7]. Such concepts are abstract in nature and could be difficult to even novice programmers [16], let alone non-computing major undergraduates and secondary school students. Indeed, according to our survey to secondary school teacher participants of our short course, about 82% of the respondents agreed that computer programming and algorithms are the hardest topics to teach.

There is usually considerable overlap between the contents of a computer subject in a secondary school and those of a first year course on computer programming in a university. As such, the difficulties encountered by secondary school teachers are in many ways similar to those faced by the professors in universities, as far as the teaching of basic computer programming and elementary algorithms is concerned.

Nevertheless, usually only the academically more capable students will enter universities. As a whole, the secondary school student population is less mature in intellectual development and more diverse in their academic ability. Compared with university students, many of the secondary school students tend to be less motivated and less capable of independent learning; they normally require more guidance in their studies.

Secondary school teachers are generally less well informed and possess far less resource under their disposal than university educators. To our knowledge, a great deal of research has been done in many universities to address the difficulties in learning computer programming and algorithms [1,5,6,7,12,15]. Unlike universities, however, secondary schools seldom have the resources and expertise to perform similar work to solve their problems. In fact, they might not be aware of such research activities. Our approach in the course is to facilitate the use of university resources on the Internet by secondary school teachers to solve their own problems.

3.3 Program visualisation and algorithm animation

Program visualisation refers to the use of graphical artifacts to represent both the static and dynamic aspects of a program [11]. Algorithm animation portrays the dynamics of the execution of an algorithm by means of animation tools [7]. Educators and researchers have long believed that visualisation and animation are useful in helping students understand the abstract concepts and dynamics involved in computer programming and

algorithms [15]. It is believed that visualisation and animation tools help the learners by displaying in concrete form the mental model of the execution of computer programs. Indeed, many universities worldwide have been actively researching and experimenting with the use of visualisation and animation tools. As a result, a variety of such tools have been developed for different purposes [1,5,6,7,12,15]. Many experimental results have been reported that favour the use of such tools for enhancing program understanding [6,7,15].

4 Exploiting Internet resources for useful educational software tools

Despite years of active research, program visualisation and animation tools are still not widely used in secondary schools, and few such tools designed for teaching and learning are available commercially.2 As discussed in Section 2.2, it is often impractical for secondary schools to develop their own tools.

As computer science researchers and educators, we are aware that many program visualisation and algorithm animation tools have been developed as results of research work in various universities. Even though some tools have been developed mainly for demonstrating the research ideas and therefore might not have as many features as commercial software, most have been designed for teaching and learning. More importantly, they are usually available for free and easy access through the Internet for educational purposes. To our judgment, there are great potentials of utilising such tools in enhancing teaching and learning in secondary schools.

The idea of utilising research tools on the Internet for enhancing secondary school education is obviously appealing and has many advantages over acquiring similar tools by other means. We shall discuss these further in Section 6. However, before being convinced of the practicality of this idea, we had two concerns. Firstly, although these tools had been successfully applied in the tertiary education context, would they be useful in secondary schools as well? Secondly, would secondary school teachers be competent enough to make use of these tools that have originally been designed for use by tertiary educators who are technically more proficient?

To develop this idea further, we set out to evaluate the practicality of using Internet resources as teaching and learning aids in secondary schools. As program visualisation and algorithm animation do not fall into our own research areas, we started our search from only the scarce information that we had. Beginning with the Web sites of two well known researchers in these areas that we incidentally came across and made note of a few years ago, we followed links over links, and so on. It turned out that there was little difficulty in the search of relevant Internet resources. The more tedious and time-consuming task was to evaluate the contents of these resources one by one. Even so, within a few weeks' time, we were amazed to have collected and evaluated almost a hundred sites of related interest! These resources range from the innovative use of common spreadsheet software by researchers in the University of Helsinki [12], to ambitious laboratory projects such as the DYNALAB project of Montana State University [1], and university students' research projects such as Jeliot [5].

We selected and evaluated the resources according to several criteria: (1) relevance in content and level to the syllabus of secondary school computer subjects, (2) accessibility, (3) flexibility (customisability), (4) software and hardware requirements, (5) difficulty in technical content, (6) ease of setup and customisation. After evaluation, we decided to recommend about 30 web sites. The contents of these web sites range from ready-made animations of common algorithms, to downloadable program visualisation tools that support both forward and backward execution [1], and even online animation of user-defined algorithms using customisable 'actors' in a 'theatre-like environment' [5].

Through the process of selection and evaluation, we are increasingly convinced of the practicality of our approach. Many of the tools we found could be effectively used by people with some elementary knowledge of computer programming and concepts of program visualisation. Our participants were computer teachers who clearly possess knowledge of the former but not necessarily the latter. Therefore, part of our short course was to explain the program visualisation concepts and how they could be useful to aid program

[2] Although most commercial program development environments do provide some limited facilities such as the display of the contents of variables during program execution, these are primarily designed to aid software development (particularly to aid debugging) by programmers. These facilities are not targeted to beginner learners and usually not well suited for the purpose of teaching and learning.

understanding.

5 Course implementation and feedback

Our course began with discussions on the common problems in developing CAI software. Then we introduced various sources from which useful CAI software could be obtained freely or at nominal costs for topics in computer subjects in general. These sources included higher educational institutions, students pursuing higher education, professional educational bodies, textbook publishers and others. The use of these Internet resources was more straightforward and requires no further elaboration other than the provision of pointers.

Next, we introduced the concept of utilising program visualisation techniques for the enhancement of teaching and learning, and the corresponding selected Internet resources. For ready made animation tools that were straightforward to use, we simply provided pointers and made two representative demonstrations, leaving the participants to try and pursue the tools at their own pace after the course.

A few selected tools, however, were introduced in much more detail. These tools have one or more of the following characteristics: (1) they were technically more advanced; (2) they could be used in several ways to suit different educational purposes; (3) they had features that were particularly useful or illuminating; (4) their designs were based on notions that were innovative and less obvious to understand but practically very useful. Fortunately, the participants were mainly computer teachers whom could be safely assumed to possess the necessary programming skills and concepts to perform the required customisations. Were we to simply show the links of these resources, it could be difficult for them to tap the potential benefits of these tools effectively.

The participants were so interested in the selected Internet resources that the course was substantially overrun. At the end of the course, participants were requested to complete a questionnaire about their background (for planning of future courses) and about how well they felt the course had been organised (for evaluation of the present course). Some of the statistics obtained are as follows:

1. About 82% of the respondents agreed that computer programming and algorithms are the hardest topics to teach.
2. About 90% of the respondents agreed (with 26% strongly agreed) to the statement that "I will try to make use of the course materials at school when appropriate". None disagreed; the rest were undecided.
3. About 87% of the respondents agreed that the course was useful to them; none disagreed and the rest were neutral. The same number of respondents agreed that they were satisfied with the course. Some felt that the course could have been improved by extending the duration to allow more time for further discussions.
4. All respondents agreed that the demonstration of the Internet resources for teaching was the most useful part in the course.

6 Summary and discussions

6.1 Characteristics of our approach

We began with the ideas that program visualisation tools are useful for learning computer programming, but such tools are not widely known, of limited availability and hard to develop by secondary school teachers themselves. Yet Internet resources abound that could be effectively exploited for use in secondary schools. As researchers in the university, by nature of our work we are usually better informed with the availability of such resources and the advancement of the latest technologies. In planning and designing the short update course for teachers, we positioned ourselves as mentors in the search of relevant teaching resources. We aimed at offering practical assistance to secondary school teachers by providing the source of relevant information on the Internet, by demonstrating the potential benefits of utilising such information, and by guiding them through the solutions to the technical problems that might arise in utilising such information. We attempted to motivate the interests of participants, to help them overcome the initial barriers (that is, to make "jump start") so that they could eventually help themselves exploit the vast potentials of Internet resources via self and lifelong learning. Incidentally, in so doing, we have exemplified our course as an alternative model of "teaching in the information age" in which teachers serve more like a mentor than an

authoritative knowledge provider.

Our approach is characterised in several ways which distinguish it from that of a traditional teacher education course. Firstly, our goal was modest yet pragmatic in trying to address a specific but real problem that a typical secondary school computer teacher encounters daily: the difficulties of teaching computer programming. Secondly, we demonstrated to the participants how Internet resources could be effectively and practically utilised for addressing their problems. What is even more distinctive is the recommended use of tools developed by researchers with the latest software technologies of the field for use in tertiary education. We have argued that both tertiary educators and secondary school teachers share many common problems that call for similar solutions. Secondary school teachers could learn a great deal from the experience of educators in universities when dealing with their common problems. Finally, the course was designed to be enabling and empowering, with the explicit a priori goal that participants could pursue the subject further via self and lifelong learning.

6.2 Reflections and discussions

On completion of the course with encouraging feedback from the participants, we reflect on the factors contributing to our success. We note that a key factor is our decision to take advantages of the use of selected Internet resources, especially those from universities worldwide. Firstly, these resources are easily *accessible* to teachers and students alike, as long as they are connected to the Internet. The ease of access also minimises the problems that might occur in the distribution and installation of custom developed or commercial software. Moreover, the use of educational tools on the Internet is *cost-effective*. Many of these tools have been demonstrated to be effective through their use in universities. They are typically designed by computer scientists for demonstrating the advantages of applying their research ideas in education, and have subsequently been experimented and evaluated for continuous enhancements, with such evaluations adequately documented in their research papers. More importantly, they are available freely or at affordable costs. Cost is often a critical factor determining whether an educational software tool will be widely used in secondary schools, as resources at their disposal are usually fairly limited.

Some of the software tools we recommended were developed as prototypes with source codes publicly available [12]. They are usually based on sound theoretical principles and accompanied by technical or educational papers describing the theory and implementation in detail. Teachers may customise these tools to suit their specific needs that might vary due to differences in teaching styles, objectives, and students' backgrounds. They may choose to use the whole or part of the tool, or write small program components to be integrated with these tools. For computer teachers who are acquainted with and probably interested in writing programs, such "lightweight customisation" is usually easier and more feasible than building a complete CAI system from scratch. Customisation by users is not normally adequately supported by commercial software that comes with no source code and only limited documentation such as operational guides.

Technologies and knowledge have been advancing very rapidly. On the Internet, new resources keep emerging as results of continuous research by academics who explore the latest technologies for the enhancement of teaching and learning. An example is the experimentation of using 3D visualisation, multimedia and virtual reality technologies in education as they emerge [4]. Teachers who are well informed of such activities through self-learning on the Internet will be in a better position to make use of the latest research results and technologies for continuous improvements to their teaching and learning in ways that are not otherwise possible.

The use of research tools for teaching and learning is not without problems. However, most of these problems would not be deterrent; they could be solved or avoided. Other problems are present in the use of other sources of educational software anyway. For instance, research tools are often imperfect, with some functionality not fully implemented; but as long as the implemented features are considered useful, the tools can be used in part rather than in full. There might be a lack of instant technical support, but many researchers who develop the prototypes are keen to collect feedback, as these might be crucial for their continuous research work. Inevitably, frequent revisions might occur to these tools for research purposes, but if the teacher finds an earlier version useful, that version could be downloaded and kept for use instead of relying on its availability at the source.

7 Conclusions

University educators possess the necessary resources, expertise and freedom to fulfil their roles of performing experimentation and researches, and producing prototypes to demonstrate the usefulness of their innovative ideas. In comparison, secondary school teachers are too occupied with teaching activities and other professional commitments. Most teachers cannot afford the purchase of expensive commercial software for teaching, nor do they generally have the capacity of developing appropriate educational software on their own. Success of integrating IT in the school curriculum is critically determined by the availability of easy-to-use and adaptable tools that satisfy the diverse needs of teachers and students of a variety of backgrounds in different contexts.

The Internet has provided a medium on which tertiary educators can make their resources and experience publicly available to be shared by all, including secondary school teachers. Around the world, numerous tertiary educators have gladly done so as part of their service to the community. Unfortunately, such resources are largely under-utilised by secondary school teachers, due to reasons such as the lack of knowledge and technical competence. For computer teachers, these barriers are relatively easy to overcome, as long as appropriate support and assistance is provided. For teachers of other disciplines, more help might be required. Ultimately, secondary school teachers have to learn, adapt and use these resources by themselves, and to keep themselves updated via self and lifelong learning to respond to the rapid changes that the world has been undergoing.

In this paper, we have reported our experience in the design and delivery of a short course that has progressed towards this direction. Our course also exemplifies itself as one possible model of "teaching" as "facilitating the self and lifelong learning of the participants". Most tertiary educators have now become regular users of Internet resources for enhancing their teaching and learning. It should not be long before secondary school teachers have to follow suit. What we have contributed is but a small part of the continuing collaborative effort to empower teachers to use IT effectively in secondary schools, and ultimately to better education of our younger generations.

References

[1] Boroni, C. M., Eneboe, T. J., Goosey, F. W., Ross, J. A. and Ross R. J. (1996). "Dancing with DynaLab – Endearing the science of computing to students". In *Proceedings of the Twenty-Seventh SIGCSE Technical Symposium on Computers Science Education (SIGCSE'96)*, 135-139, Philadelphia, USA, February 1996.

[2] Curriculum Development Council (1993). *Syllabuses for Secondary Schools, Computer Studies (Secondary 4-5)*, Hong Kong Government Press.

[3] Education Manpower Bureau (1998). *Information Technology for Learning in a New Era: Five-year Strategy 1998/99 to 2002/03*. November 1998, HKSAR.

[4] Gloor, P. A. (1998). "Animated algorithms". In Stasko, J., Domingue, J., Brown, M. H. and Price, B. A. (eds), *Software Visualization: Programming as a Multimedia Experience*, MIT Press, Cambridge, MA.

[5] Haajanen, J., Pesonius, M., Sutinen, E., Tarhio, J., Terasvirta, T. and Vanninen, P. (1997). "Animation of user algorithms on the Web". In *Proceedings of IEEE Symposium on Visual Languages (VL'97)*, 361-367, Isle of Capri, Italy, September 1997.

[6] Kalayar, M., Ikematsu, H., Hirashima, T. and Takeuchi, A. (1999). "Intelligent learning support system for algorithm learning". In *Proceedings of 7th International Conference on Computers in Education (ICCE'99)*, **2**: 840-843, Chiba, Japan, November 1999.

[7] Kann, C. and Lindeman, R. W. (1997). "Integrating algorithm animation into a learning environment". *Computers and Education*, **28**(4): 223-228.

[8] Kong, S.-C., Au, W.-K. and Pun, S.-W. (1999). "A case study on the implementation of information technology education pilot scheme in Hong Kong". In *Proceedings of 7th International Conference on Computers in Education (ICCE'99)*, **2**: 27-34, Chiba, Japan, November 1999.

[9] Law, N., Wan, J., Lau, M. F., Lee, R. and Yuen, A. H. K. (1999). "Towards a model of IT training for inservice teachers". In *Proceedings of 7th International Conference on Computers in Education (ICCE'99)*, **2**: 51-58, Chiba, Japan, November 1999.

[10] Mulholland, P. and Eisenstadt, M. (1998). "Using software to teach computer programming: Past, present and future". In Stasko, J., Domingue, J., Brown, M. H. and Price, B. A. (editors), *Software Visualization: Programming as a Multimedia Experience*, MIT Press, Cambridge, MA.

[11] Price, B.A., Baecker, R.M., and Small, I.S. (1993). "A principal taxonomy of software visualisation". *Journal of Visual Languages and Computing*, **4**(3): 211-266.

[12] Rautama, E., Sutinen, E. and Tarhio, J. (1997). "Excel as an algorithm animation environment". In *Proceedings of Annual Joint Conference Integrating Technology into Computer Science Education (ITiCSE'97)*, 24-26, Uppsala, June 1997.

[13] Resmer, M. (1999). "IMS – Distributed learning standards". In *Proceedings of 7th International Conference on Computers in Education (ICCE'99)*, 2: 567-570, Chiba, Japan, November 1999.

[14] Sloane, A. (1997). "Learning with the Web: Experience of using the World Wide Web in a learning environment". *Computers and Education*, 28(4): 207-212.

[15] Stasko, J. and Lawrence, A. (1998). "Empirically assessing algorithm animations as learning aids". In Stasko, J., Domingue, J., Brown, M. H. and Price, B. A. (editors), *Software Visualization: Programming as a Multimedia Experience*, MIT Press, Cambridge, MA.

[16] Yu, Y. T. and Poon, P. L. (2000). "An approach for evaluating the quality of software developed by novice programmers". In *Proceedings of the 4th World Multiconference on Systemics, Cybernetics and Informatics (SCI'2000) and the 6th International Conference on Information Systems Analysis and Synthesis (ISAS'2000)*, 2: 485-490, Florida, USA, July 2000.

Learning from the Learning of other Students

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This paper concerns the use of dialogues in student learning and how such dialogues can be captured for subsequent use by other learners. The process of learning by observing another person' s learning is known as vicarious learning. The paper begins by discussing the movement towards more flexible types of learning and the belief by many that traditional dialogue has been omitted from a lot of today' s courseware. Dialogue can be considered as one of the stages in the learning cycle and to support it there is a need to create tertiary courseware, this being the third stage in the cycle. Some of the research that has taken place into vicarious learning is described and this has shown that it has some benefit to learning and also produces positive feelings in students of being part of a learning community. Finally the vicarious learning resources that have been produced within a software development course at Edith Cowan university using a dynamic screen capturing tool are discussed together with a possible dissemination system.

Keywords: **Distance Education, Flexible learning, Vicarious Learning, Programming**

1 Introduction

Universities and colleges today have record numbers of students and yet the cost being spent per student is steadily decreasing as budgets are cut and universities become ever more competitive. One of the consequences of this is that many managers are turning to the Internet as a means for delivering courseware to students in a supposedly cost-effective manner. Students are also demanding more flexible learning with learners being able to learn when they want (frequency, timing, duration), how they want (modes of learning), and what they want (that is learners can define what constitutes learning to them) [14].

The situation has therefore arisen that students spend more time away from a traditional campus and technology is being used to provide the necessary flexibility with computer networking empowering connectivity and communication, allowing synchronous and asynchronous one-to-one and one-to-many communication [13]. However, such technology does not necessarily support some of the learning situations that are necessary in higher education. Laurillard [6] points out that learning in many educational contexts, particularly in higher education, requires learning about descriptions of the world, knowledge derived from someone else's experience, and from understanding someone else's arguments. She states that:

> *We cannot claim to have sorted out once and for all what students need to be told if they are to make sense of topic X. No matter how much detailed research is done on the way the topic is conceptualised, the solution will not be found in new ways of putting it across. The new way of telling may sort out one difficulty, but it may well create others. All we can definitely claim is that there are different ways of conceptualising the topics we want to teach. So all we can definitely conclude is that teachers and students need to be aware of those differences and must have the means to resolve them.*

The main way this has been done in the past has been by students participating in dialogue with fellow students and their tutors. We do have email and synchronous "chat" available to support dialogue to some extent but it may well be argued that this is insufficient to support the above.

2 The Learning Cycle

Dialogue can be considered as a crucial part of the learning cycle [9]. The cycle is shown in figure 1.

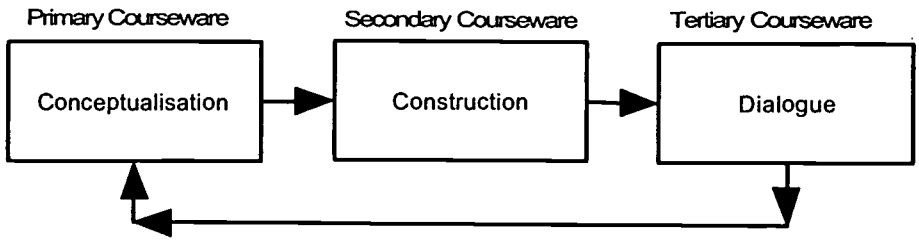

Figure 1: The learning Cycle

It can be considered to comprise:

- conceptualisation which comes from interacting with the primary content and relates to a learner's current state of understanding.
- construction and the use of knowledge occurs with the use of secondary courseware tools such as concept mappers. It involves picking out particularly relevant material, putting the information together in ways which have meaning for the learner, and relating old and new material into a coherent whole.
- dialogue which involves the testing of understanding and can possibly be facilitated with tertiary courseware.

Mayes et al [9] suggest that the third section of the learning cycle, dialogue, can itself be broken up into three stages, these being discussion, reflection and reification. Mayes et al agree with Laurillard that discussion is fundamental to effective education and that a deep understanding is promoted far more effectively and efficiently during discussions. Reflection has always been thought to be an important aspect of learning and can be considered as the testing of new knowledge against the schemata that hold our existing knowledge. And finally reification is a term put forward by Mayes et al and concerns the structuring of newly acquired knowledge into a new object of thought integrated with other knowledge.

The question then arises as to what sort of tertiary courseware can be produced and utilised to support the dialogue aspect of the learning cycle bearing in mind that the material will have to be used in flexible learning environments. One particularly interesting line of research has been into recording of discussions and making them available to other students in a flexible mode. This concept is known as vicarious learning where this is defined as [2]:

> *The potential benefit to learners of being able to observe or 'listen in' on experts or their peers as they discuss a new topic.*

The following can be considered to be vicarious resources:

- Frequently asked questions (FAQs). Here students can learn from the answers to typical questions posed by other students.
- Listservers. These promote vicarious learning as students receive the text dialogues that take place between various subscribers. The term "lurker" is often used for the person who does not participate in dialogues but prefers to simply observe.
- Bulletin boards. These provide the means for asynchronous dialogues and again can be used by "lurkers".
- Chat rooms. These provide the means for synchronous dialogues.

3 Research into Vicarious Learning

Research initiatives are in two main areas, the first attempting to determine if vicarious learning is of benefit to students and the second looking at how such dialogues might be made available as tertiary courseware for re-use by other students.

There are several interesting questions that might be worthy of investigation in the first area. Cox et al [2] suggest that we need to determine who are useful models for the vicarious learner, experts or novices. It might be better to observe experts as skilled behaviour would hopefully be modelled in a clear way, although this is not of course always true as many experts find it difficult to make their knowledge explicit. It could be argued that student – student dialogues would be better to observe as the observing student would be better able to identify with other students. Also the students participating in the dialogue might use more appropriate language and also ask questions of each other that they may not have wished to ask their tutor. Cox et al also point out that observing unskilled behaviour may also prove to be of benefit as the observing student would determine from the dialogue what sort of errors to avoid without having to make those errors themselves. Also of course, the dialogue type to observe may depend on the type of student who is the observer. It might be more appropriate for a strong student to observe experts and for a weak student to observe novices.

In one particular piece of research on vicarious learning [7] benefits were found that were both cognitive, with an increase in knowledge and understanding in the particular curriculum area, and social with exposure to peer discussion creating positive feelings of being part of a learning community.

Lee et al [7] carried out research within an on-line Masters level course in Computers in Teaching and Learning. They created task-directed discussions (TDDs) in order to capture good learning dialogues amongst students and to overcome the "barriers of silence" that might otherwise occur. Over 30 hours of discussions among students, and between students and a tutor (the expert), using the TDDs were videoed.

An architecture called the Dissemination System (DS) was created from primary instructional materials and integrated clips taken from the videos. The DS allows a multimedia database of video and audio clips, text transcriptions, and annotated graphics to be integrated with primary expository teaching material and delivered via the Web. The system was then used in an experiment to investigate the vicarious resources in a controlled laboratory setting.

The experiment used a section of the course on Models of Learning with Technology. Two sets of learning materials were created, the first comprising primary learning materials (approximately 45 web pages) and the second comprising both primary learning materials and an integrated set of vicarious learning resources. The vicarious resources had been obtained from the videoed dialogues and comprised 108 video clips, 13 audio clips, 43 text transcriptions, and 27 audio annotated graphics. The resources were accessible by either clicking on highlighted keywords or by a search mechanism.

Two groups of students took part in the experiment, one using only the first set of learning materials whilst the other used the second set of learning materials which included the vicarious resources. The conclusions that Lee et al drew from the experiment were that there were some benefits in learning and substantial positive changes in attitudes and discussion behaviour for the students who used the vicarious learning resources. The researchers also make the point that although some people claim that learning can only take place when students are personally engaged in discussion, the evidence suggests that observing peer dialogues can, on the contrary, provide a useful source for learning, both cognitively and socially. The researchers have in fact suggested that such vicarious learning may sometimes be more beneficial than being a participant, depending on the state of the learner [11].

The web based materials used in the experiment are available at http://www.hcrc.ed.ac.uk/Vicar/TT/. They are fairly slow to download from the Web but realistically they could be put onto a CD ROM for use with distance learners. The audio dialogues that are available are played whilst a static graphical image is displayed to the leamer. Such a dialogue concerns the graphic being displayed and I felt that something was lost in this type of dialogue and that it would have proved to be more useful and meaningful if objects on the graphic could have been "pointed to" in order to draw the observer' s attention to the important aspects of the graphic.

4 Creation of Vicarious learning Resources with Dynamic Screen Capturing Tools

During the summer school of 1998 at Edith Cowan University, I made use of Lotus ScreenCam for student-tutor dialogues within a Software Development unit. Between lectures and laboratory sessions, students had

no contact with me as I was off campus, however I did have access to email at home enabling students to send me ScreenCam movies of any programming problems that they were having. In addition to movies, students would also send the programming code enabling me to use this when making a "reply" movie. An example of a screenshot taken from a movie, which was sent to me by a student, is shown in figure 2.

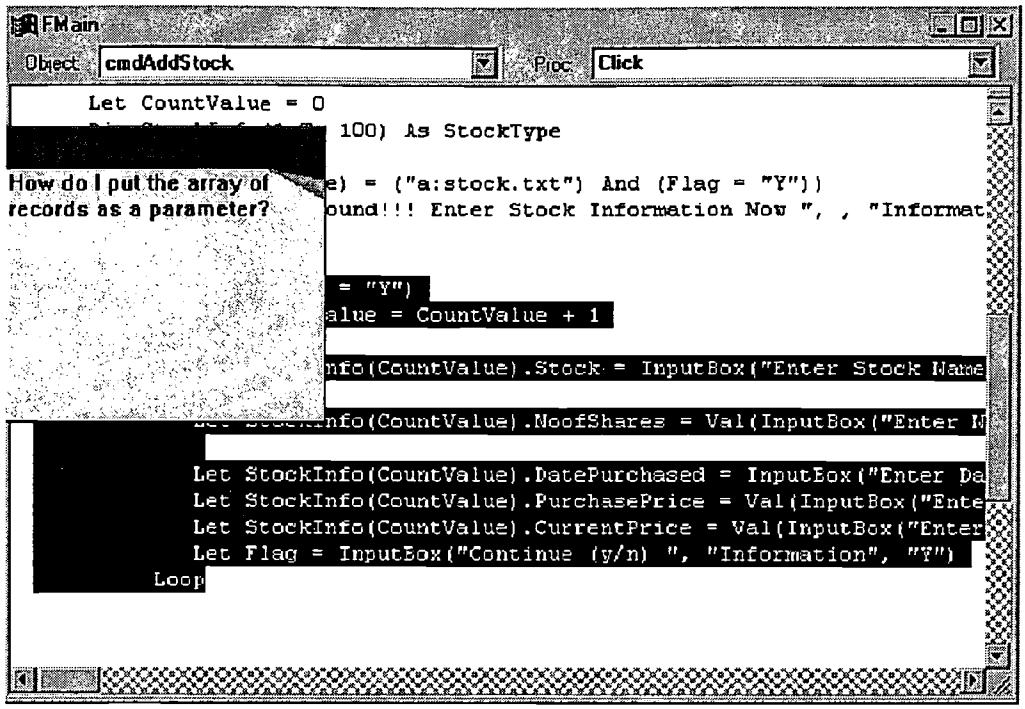

Figure 2

The movie had several text captions and concerned a problem that this student was having with passing arrays to subprograms in Visual BASIC. A screenshot taken from the movie, which I made and subsequently sent back to the student, is shown in figure 3.

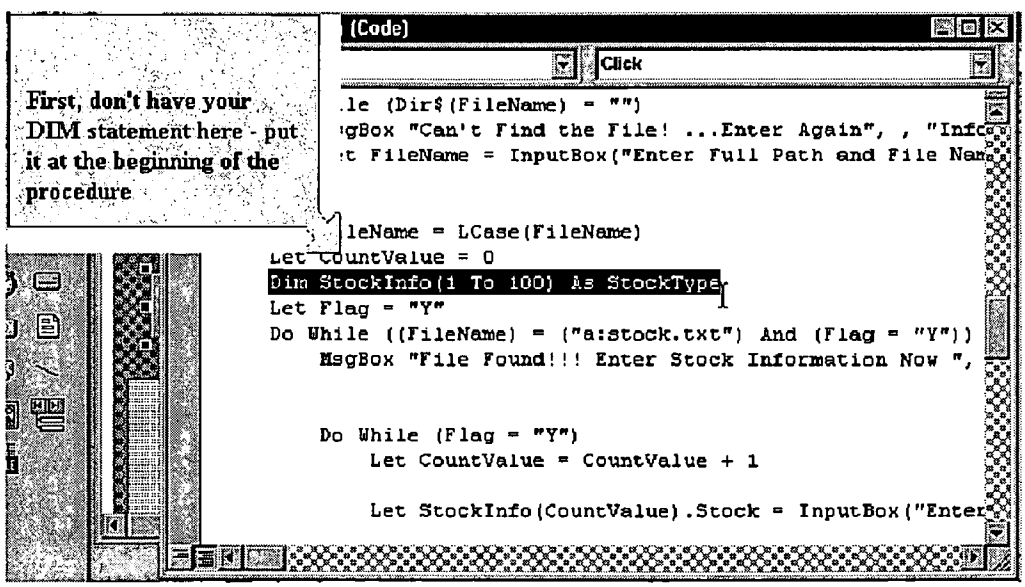

Figure 3

The screenshot in figure 3 includes a text caption that has nothing to do with the original student problem. It

is the sort of comment that I would make if I were looking at the code that a student had produced in a laboratory session. In the rest of the movie, I was able to make suggestions on how to overcome the original problem and I also included a captioned comment about the lack of comments within the student's programming code. By using ScreenCam, I had been able to engage in a richer asynchronous dialogue with the student than I would otherwise have done by conventional means. In addition, as a side effect, I was building up vicarious learning resources for use in future semesters.

In addition to capturing asynchronous dialogues as described above, Lotus ScreenCam can be used to provide rich feedback to students on their assignment work. Simple "low-tech" audio tapes have been used in student feedback [1] and it is suggested that such feedback adds a social dimension to the commentaries with the tutor being able to talk personally to each student, whereas written comments lacked context and sounded impersonal.

I produced a set of such movies for the small group of campus-based students that were involved in the 1998 summer school session mentioned earlier. Each week the students attempted a small programming problem and handed in the relevant programming code together with a small text -captioned movie explaining their program. I then made a feedback movie for each student. Each feedback movie had audio commentaries to keep the production time to a minimum and the movies were placed onto ZIP disks that had been provided by the students. I was able to go through the programming code on the screen, highlighting areas of interest with the cursor whilst making comments and in addition run the student programs with a variety of data whilst passing comments about both the good and the bad points of the programs.

The sets of movies that the students handed in and that I produced have now become another vicarious learning resource for use by students in subsequent semesters. Each week, students are given a small programming problem to attempt and they can then use the movies to view the student – tutor interactions for a similar programming problem. In practice, students have commented on how useful they have found these resources. Feedback was elicited on-line and some of the comments follow:

- I found it helpful and interesting in giving clear visual instructions or explanations.
- All the other students solutions were very helpful. And they were informative.
- Only used the movies once, but they do provide a good resource for students experiencing difficulty.
- Pick up other students mistakes.
- Always forgot how to get to them
- Probably slack, but using the sound was too much hassle.

5 Delivery Mechanisms for Vicarious Resources

The last two student comments above indicate that there is a need for some form of technological delivery mechanism for the vicarious resources that have been produced that is simple and easy to use. Students need to be able to quickly find movies that are appropriate for the programming problem that they are attempting and then view the movie. We have experimented using the Web to deliver the movies however this has been a problem as movies with audio are of the order of 1MB in length per minute and take too long to download. Realistically it is necessary to make the movies available on CD ROM and we will be using a Windows Help file as a way of delivering the movies. There are several Help file authoring tool available and one that I have used extensively is ForeHelp [4]. A Help file can be produced with the usual contents and index pages with little effort and programs can be launched seamlessley thereby permitting the running of ScreenCam movies.

6 Discussion

It would appear that the use of vicarious learning resources by students can benefit learning and also provide positive feelings of being part of a learning community. However the creation of such resources needs to be done very carefully so that they are relevant and of interest to learners. If a synchronous dialogue is to be recorded by the use of video or audio then it is important to use task directed discussions [7] to ensure that a relevant dialogue ensues. Asynchronous dialogues usually take place by email or bulletin boards, however

they can be made richer if a dynamic screen capturing tool is used. Finally the vicarious learning resources that have been collected need to be made available to other learners and to this end Lee et al created a web based dissemination system. Another approach is to use a Windows Help file for disseminating such resources assuming that delivery is to be by Wintel hardware only.

In the future I intend to look at capturing synchronous dialogues using a dynamic screen capturing tool. These would be both student – student and student – tutor where the two participants sit in front of a PC whilst having a dialogue concerning a program that is being displayed.

References

[1] Anson, C. M. (1997). In Our Own Voices: Using Recorded Commentary to Respond to Writing. New Directions for Teaching and Learning, Spring 1997(69), 105-113.

[2] Cox, R., J. McKendree, et al. (1998). Learning vicariously from educational dialogue and discourse. 20th Annual Conference of the (US) Cognitive Science Society, Madison, Wisconsin.

[3] Domingue, J., & Mulholland, P. (1997). Teaching Programming at a Distance: The Internet Software Visualization Laboratory. Journal of Interactive Media in Education (http://www-jime.open.ac.uk), 1, 1-28.

[4] ForeHelp User' s Guide (1995). ForeFront Incorporated

[5] Garner, S. (1997). Cost Effective Multimedia Production for Frequently Updated Courseware. Paper presented at ASCILITE 97, Curtin University, Perth.

[6] Laurillard, D. (1993). Rethinking University Teaching: A Framework for the Effective use of Educational Technology, London Routledge.

[7] Lee, J., F. Dineen, et al. (1999). Vicarious Learning: cognitive and linguistic effects of observing peer dialogues. American Educational Research Association (AERA '99), Montreal, Quebec.

[8] Lotus Corporation. (1997). White Paper (Technical) http://www.lotus.com/home.nsf/welcome/screencam, (accessed on June 23, 1999)

[9] Mayes, J., J. McKendree, et al. (1996). The Vicarious Learner: Rethinking the use of dialogue in teaching and learning, http://www.hcrc.ed.ac.uk/gal/vicar/VicarPapers/vicar.html (accessed on Aug 4, 2000).

[10] Mayes, J. T., & Neilson, I. (1996). Learning from other People's Dialogues: Questions about computer-based answers. In B. Collis & G. Davies (Eds.), Innovating Learning with Innovative Technology . Amsterdam: North-Holland.

[11] McKendree, J., K. Stenning, et al. (1998). "Why observing a dialogue may benefit learning." Journal of Computer Assisted Learning **14**: 110-119.

[12] Neville, L. (1995). Sense-making and Sensitivities: New Pedagogies? New Practices? New Acceptance of Old Ways of Learning? Australian Educational Computing (May 1995), 15-19.

[13] Nikolova, I. and B. Collis (1998). "Flexible learning and design of instruction." British Journal of Educational Technology **29**(Jan. '98): 59-72.

[14] Van den Brande L (1993). Flexible and distance learning John Wiley, Chichester, UK

Strategies for Searching in the WWW

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Searching information in the WWW effectively and efficiently is an important vehicle for 21st century citizens to become lifelong learners. This study was to identify effective information-seeking strategies by comparing the strategies employed by the Internet novice user and those by the expert user. A searching task followed by an interview were undertaken in order to observe the strategies used by the subjects. Pre-task and post-task surveys were also administered to collect data relating to subjects' background and self-efficacy toward using the Internet. Protocol analysis was used to analyze the verbal data collected in this study. The results showed that the expert and the novice employed different information-searching strategies in the following six aspects: computer self-efficacy, task anxiety, search aids, information processing, concentration, and problem solving.

Keywords: **Searching Strategies, Lifelong Learning, WWW**

1 Introduction

Lifelong learning has been recognized as an important goal of education in the twenty-first century [14]. With increasingly tremendous information to face everyday, searching desired information effectively and efficiently becomes a necessary skill for learning in such an information age [4, 6]. Due to its efficiency and popularity, the World Wide Web (WWW) is becoming a powerful vehicle for reaching the goal of lifelong learning.

However, it seems not easy for Internet novice users to search information effectively and efficiently via the web. For example, disorientation was reported as a problem that the novice explorers might have while navigating within a hyperspace [2]. It was often to lose directions if they were lack of self-conscious in searching motivation, strategies, results, and meanings. Borgman suggested future research to compare novice and expert users' cognitive behaviors while they are doing a specific searching task in order to find the key factor to accomplish the task [1].

Prior research indicated that users' metacognitive ability, orientation conscious, system knowledge, domain knowledge, and system design influenced users' searching strategies while navigating in a hypermedia environment [6, 10]. Users' computer knowledge and information processing skills were particularly emphasized as important factors to determine a successful searching [4]. Except by improving the system design to help users perform self-reflection during the information-seeking process [9, 7], future research was suggested to evaluate the application of metacognitive skills in an Internet-based learning context [4, 5].

According to the literature about metacognitive strategies [12, 16], learners need not only to have self-conscious about their own learning but also have to know what strategies they can use and how to use them in order to enhance their metacognitive abilities. In addition, it is more important for students to know how to learn than what to learn in order to reach the goal of lifelong learning [14]. Teaching students about how to learn has been demonstrated to be effective to improve students' achievement and attitudes in various learning domains [8, 13]. However, little research explored the strategies specifically for searching information in the WWW.

Hill [5] described a conceptual framework for how users formulate and employ information-seeking

strategies in open-ended information systems (OEISs), e.g. the Internet. Two stages of information seeking were presented in this model. The first was navigational stage, which included the following processes: purposeful thinking, acting, and system responding. The second was process stage, including evaluation, transformation and integration, and resolution. With limited metacognitive ability and unawareness of computer application skills, novice users tended to suffer information overloading. They often repeated the behaviors which were recognized in the navigational stage, but seldom performed the actions belonged to the process stage. However, experienced users were able to utilize the searching strategies that were recognized in both stages [5]. They also showed how to control and manage their searching process. It seemed that users' self-awareness about their own searching ability, self-reflection, self-control and self-management about their searching process were keys for successfully seeking information on the Internet.

In order to become lifelong learners, all citizens of the next century must know what strategies they can use for searching information effectively and efficiently on the WWW and how to use them. If the Internet is an important vehicle for lifelong learning, then identifying effective WWW searching strategies should be the first step to reach the goal.

2 Purpose

The purpose of this study was to identify effective WWW information-seeking strategies by comparing the strategies used by Internet novice users and experienced users. Therefore, the research question of this study was: What are the differences between the strategies used by Internet novice users and those used by Internet experienced users while searching information on the WWW?

3 Methodology

Two in-deep case studies followed by a between-case comparison were used to answer the research question. A college freshman, as an Internet novice user, and a college graduate working at a computer technology company, as an Internet expert user, were volunteered to participate this study. Both subjects were asked to perform a searching task alone through the WWW by using a web browser, Internet Explorer. The goal of the task was to find a freshmen course schedule of a specific department in a large university in Taiwan. The searching processes were both videotaped for observing subjects' searching paths, number of websites visited, and the time spent on each site. During the search, subjects were asked and continuously reminded to perform think-aloud in order to collect verbal information for protocol analysis [3] of their searching strategies. Pencils and blank answer sheets were issued to subjects for taking notes or answers.

Before searching, a survey was administered to collect subjects' Internet background, including their Internet using history, frequencies of Internet access, Internet access availability at home, Internet courses taken before, and self-efficacy about searching information on the WWW. Right after the searching task, subjects were given another survey to reflect their self-satisfaction toward their performance in the task. Subjects were further interviewed by the researcher if there was a need to clarify on the videotape. Subjects' searching paths, actions, responses, and think-aloud protocols were analyzed for each case and then compared between cases.

4 Results

Comparing the data collected from pre-task and post-task surveys, searching paths, verbal scripts and blank answer sheets, several different characteristics showed between the Internet novice user and expert user. First of all, the expert finished the task and got desired information after visiting 30 in 18 minutes, whereas the novice visited 19 websites in 24 minutes with a blank answer. Except for different searching results between the cases, this also showed that the expert's navigating speed was as about twice as the novice's. In addition, the expert spent less than one minute on each website, whereas the novice spent more than one minutes on five websites. This indicated that the expert processed and evaluated the information shown on computer screen much faster than the novice.

Besides, verbal scripts to complaint about system like "I hate it! It is so slow.." or to critique the website

design like "This is a poor website full of redundant information..." showed 9 times during the expert's searching and 0 during the novice's; however, anxiety or worrying responses like "How come I cannot find it..." or " I cannot..I cannot..I just cannot find it..." showed 12 times during the novice's searching but 0 during the expert's. This suggested that the expert was confident to and believed being able to find the desired information; however, the novice users were coping with tremendous amount of anxiety toward reaching the goal of the task. This was concurred with their reflections in pre-task survey about their self-efficacies toward using computer technology.

Furthermore, navigation disorientation and system problems did not happen during the expert's searching process, but happened in the novice's searching process. The novice responses with "I understand it but just don't know where to start..." "How did I get here..." and "Oh! My god. I made a mistake. What's wrong with this?" This revealed that the novice user tended to get lost and became nervous after an error occurred. However, the expert showed confidence in controlling and regulating their searching process no matter what happened in the process.

Finally, the expert was familiar with how to use search engines and data base query systems; however, the novice showed some problems with them. This implied that knowing how to use helpful searching tools on the WWW is an important issue for successful searching. Besides, the novice showed little try-and-error strategies when problems occurred; however, the expert used this strategy a lot when a bottle net occurred. This indicated that try-and-error was an important problem solving skill for a successful searching in the WWW.

5 Discussions

Based on the results of this study, the differences of strategies utilized by the Internet novice user and the expert user can be summarized as following six aspects: computer self-efficacy, task anxiety, search aids, information processing, concentration, and problem solving. Computer self-efficacy [11] means how users perceived their abilities toward utilizing computer technology. The expert user tended to have higher computer self-efficacy than the novice user. This strategy relates to users' prior computer experience and believes about learning computers. Changing the novice users' views or believes about their computer abilities might be a solution to enhance their searching effectiveness and efficiency.

Task anxiety refers to worrying about not being able to reach the goal of a searching task. This strategy relates to environmental expectation and support. Group searching task with peer support might be a solution to help the novice search information on the WWW. Search aids indicates to users' knowledge and abilities to use tools that help search on the WWW, e.g. search engines and data base query systems. This relates to users' prior-knowledge and experience of using a data retrieval system. Providing a metaphor of such a system and practicing the query skills could enhance the novice users' abilities in this aspect.

Information processing refers to the ability to read in information from computer screen, select main ideas, evaluate, transfer, and integrate the information, and finally make decisions for the next destination. Strategies like looking through headlines and hyperlinks immediately after visiting a web page could help novice users to encode web information. Except encoding, many other strategies belong to this aspect. They include differentiating, monitoring, formulating, integrating, extracting, angling, collecting, controlling, decision-making, and reflecting [5]. In addition, this study shows evidence to support Hill's [5] conceptual framework of seeking information in an open-ended information system. Because the novice did repeat the behaviors of the navigational stage [5], but seldom performed the actions belonged to the process stage [5]; however, the expert in this study did perform the actions of both stages and show how to control and manage his searching process.

Concentration means the ability to keep attention on the searching task. The novice was easy to be interrupted by unrelated program messages or outside interferes. Have the mouse pointing to text which is currently being processed or read the text loudly might help the novice concentration on searching task. Problem solving means the ability to use try-and-error strategy when problems occur during searching. This strategy relates to users' creativity and problem solving styles. This strategy may be enhanced by successful practice experience.

6 Conclusions

The Internet novice users and expert users utilize different strategies to seek information in the WWW, an open-ended information system. Although the system design and users' system knowledge and domain knowledge may influence users' searching efficacy, users' metacognitive searching strategies may be enhanced through teaching and practice. By comparing the novice's and the expert's strategies used for seeking desired information through the WWW, this study identified six different aspects: computer self-efficacy, task anxiety, search aids, information processing, concentration, and problem solving. Future research should further investigate each aspect and examine the effects of the training of these strategies on users' searching efficacy.

References

[1] Borgman, C. L., "Why are online catalogs hard to use? Lessons learned from information-retrieval studies", Journal of the American Society for Information Science, Vol. 37, No. 6, pp. 387-400, (1986).

[2] Dias, P., Gomes, M. J., & Correia, A. P., "Disorientation in hypermedia environments: mechanisms to support navigation", Journal of Educational Computing Research, Vol. 20, No. 2, pp. 93-117, (1999).

[3] Ericsson, K. A., & Simon, H. A., "Protocol analysis: Verbal reports as data", Cambridge, MA: MIT Press, (1984).

[4] Hess, B., "Graduate student cognition during information retrieval using the World Wide Web: a pilot study", Computers & Education, Vol. 33, pp. 1-13, (1999).

[5] Hill, B., "A conceptual framework for understanding information seeking in open-ended information systems", Educational Technology Research & Development (ETR&D), Vol. 47, No. 1, pp. 5-27, (1999).

[6] Hill, J. R., & Hannafin, M. J., "Cognitive strategies and learning from the World Wide Web", Educational Technology Research & Development (ETR&D), Vol. 45, No. 4, pp. 37-64, (1997).

[7] Kashihara, A., Uji' I, H., & Toyota, J., "Reflection support for learning in hyperspace", Educational Technology, September-October, pp. 19-22, (1999).

[8] King, A., "Guiding knowledge construction in the classroom: Effects of teaching children how to question and how to explain", American Educational Research Journal, Vol. 31, No. 2, pp. 338-368, (1994).

[9] Lin, X., Hmelo, C., Kinzer, C. K., & Secules, T. J., "Designing technology to support reflection", Educational Technology Research & Development (ETR&D), Vol. 47, No. 3, pp. 43-62, (1999).

[10] MacGregor, S. K., "Hypermedia navigation profiles: cognitive characteristics and information processing strategies", Journal of Educational Computing Research, Vol. 20, No. 2, pp. 189-206, (1999).

[11] Oliver, T. A., & Shapiro, F., "Self-efficacy and computers", Journal of Computer-Based Instruction, Vol. 20, No. 3, pp. 81-85, (1993).

[12] Pressley, M., & Wolshyn, V., "Cognitive strategy instruction that really improve children's academic performance", Cambridge, MA: Brookline Books, (1995).

[13] Rosenshine, B., Meister, C., and Chapman, S., "Teaching students to generate questions: A review of the interaction studies", Review of Educational Research, Vol. 66, pp. 181-221, (1996).

[14] Titmus, C. J., "Lifelong education for adults: An international handbook", Elmsford, NY: Pergamon Press, (1989).

[15] Weinstein, C. E., & Hume, L. M., "Study strategies for lifelong learning", Washington, DCL American Psychological Association, (1998).

[16] Weinstein, C. E., & Mayer, R. E., "The teaching of learning strategies", Handbook of research on teaching, NY: MacMillan, 3rd Ed., pp.315-327, (1986).

The Development of a Multimedia Program for Teachers to Integrate Computers into the English Curriculum

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A self-learning multimedia program was developed for English teachers' professional development in the integration of computers into the English curriculum. This program consists of four parts: (1) study guide (2) application cases (3) computer resources, and (4) related documents. In addition, a tool box is provided to gain access to a word processing system for taking notes, or to connect to a network discussion system for ideas exchange. This program was found satisfactory based on a preliminary evaluation. However, it will be upgraded continueously in the future. At the same time, a detailed study will be followed to investigate the effectiveness of its use.

Keywords: **Multimedia, System development, ESL teaching, Teacher professional development**

1 Introduction

It is said that the use of computer technology can create authentic and rich learning environments where learners' communication skills in English may be enhanced greatly.[1][2] To have such benefits, it is important to integrate computers into the English curriculum. In so doing, many factors such as computer technology, subject matters, learners, and even the environments all need to be taken into consideration. Above all, the key factor to successful integration is the school teacher. Teachers eventually need to take the responsibility of determining when and how to use computers, and assessing the effectiveness of computer use with their students.[3] However, a survey report in 1999 by the National Center for Educational Statistics still indicated such problem since only less than 20% of current teachers in American reported feeling very well prepared for technology integration.[4] The teachers in Taiwan also have the same problems. Neither do they know what kind of computer resources available, nor do they know how to apply them to their classroom instruction. In view of this, a multimedia program was developed for middle school English teachers so as to increase their competence and confidence in the instructional use of computers, and consequently to help them integrate computers into their instruction.

In the age of information technology, teachers are required to learn about technology. On the other hand, technology can be used to promote teacher professional development. For example, Hawkes proposed the use of network-based communication for teachers to gain access to professionally relevant knowledge.[5] However, the network installation is more complicated compared to that of cd-rom. Furthermore, the quality of Internet transmission for large amount of data such as videos is still below our satisfaction. Therefore, this multimedia program for English teachers currently resides on a cd-rom instead of a web site. However, technical support is available via telephone calls or e-mails. In addition, teachers can share ideas with others by connecting to a network discussion system.

2 The Developing Process

The Systems approach to instructional design has been adopted to guide the production of this multimedia program and thus to ensure the quality of its end product. [6][7] On the whole, the process includes four phases, namely, analysis, design, development, and evaluation/revision.

2.1 Phase of Analysis

Based on the review of the literature, there is a need to enhance teachers' willingness, competence, and confidence in the use of computers in their English classrooms. Due to the advantages of convenience and flexibility, a self-learning multimedia program is proposed. Basically this program attempts to achieve the following goals: (1) to stimulate teachers to rethink the new roles of teachers in an information society, (2) to help teachers understand the principles and strategies of the classroom use of comoputers, and thus generate some possible ways of applications, and (3) to encourage teachers to follow the application cases and lesson plans provided by this program and actually apply computers to their classroom instruction

2.2 Phase of Design

After several discussions with English teachers, English teaching experts, and instructional designers, a framework of this program is finally settled as shown in figure 1. The "study guide" gives an overview of the program' s goals, operation procedures, and contents to help users get an overall view of this program in a short time. Thus the users are able to decide the best way to use the program to meet their own needs. The "application cases" provides several cases about teachers' classroom use of computers in English teaching. Since these cases are realistic, it is believed that they would give teachers strong inspirations and implications. Each case contains useful information including: (1) background of the school and the teacher, (2) lesson plan of using comp uters in his or her classroom, (3) "teaching on the spot" in the video format, (4) student reactions based on the questionnaire and interview data, (5) teacher reflections about this practice, and (6) related issues pointed out by the designer.

The "computer resources" lists the titles of cd-roms and web sites useful for English teaching. The publisher of each cd-rom and a short description of its content are provided. The address of each web site, a short description of its content, and the computer screen of its homepage are displayed. The "related documents" includes a set of helpful information regarding implementing computer technology. For example, the "future education" outlines schools, teachers, and English teaching in the future. The "use of computers" describes the strengths of computers, identifies types of applications, and presents samples of lesson plans. The "user guide" points out the issues of intelligence properties and computer ethics. It also includes software evaluation sheets. "The Imp lementation guide" reminds teachers of some factors that need to be taken into consideration in implementing computers in their classrooms. Finally, the "references" lists the titles of related articles and books so that teachers can get more detailed information if needed. In addition, a tool box is provided to gain access to the word processing system for teachers to take notes whenever they need, and to connect to a network discussion system for ideas exchange and sharing.

2.3 Phase of Development

The programming tool for this multimedia program is Authorware 5.0, and the program resides on a cd-rom to enable easy distribution. To collect the data for the "application cases", the whole teaching process of each case is video taped. Afterwards, the teaching process is divided into several steps. Accordingly, suitable video screens are selected for each step. These video screens are then transformed and stored in mpeg files. At the end of instruction, the student is asked to fill in an attitude questionnaire. Furthermore, the teacher and several students are interviewed. The whole questionnaires are then analyzed statistically, while the interview data are examined in depth.

2.4 Phase of Evaluation/Revision

English teachers, English teaching experts, and instructional designers are invited to participate in a preliminary evaluation of this program. The focus of this evaluation includes content, screen design, media effects, interface design, and system operations. This program will thus be revised and expanded according to their opinions and suggestions. In the future, a detailed study will be followed to investigate the effectiveness of its use.

3 Results and Discussion

Based on a preliminary evaluation reports by two English teachers and one instructional designer, it was found that the program's content is plentiful and practical on the whole. Moreover, the screen design is of high quality, the interface design is user friendly, and the program's operation is easy and consistent. However, some of the video screens in the "application cases" look gloomy. Sometimes, it takes efforts to identify the key plot of these screens. Finally, it is suggested to increase the quantity and variety of the cases in this program.

In regard to the quality problem of the video screens, it is because the teacher turned off all the lights in the classroom to make more readable the computer displays by a portable projector. Consequently the quality of video recording was affected. As to the small number of the cases, it is because few English teachers ever used computers in their classrooms. Most of them dare not try it. The availability of the computer hardware is another problem. At that time, there was no computer lab available for English teachers. Therefore, the three cases currently included in this program all occurred in the regular classrooms where cd-roms, a notebook computer, and a portable projector were used.

To increase the quantity and variety of the cases in this program, two cases are collected afterwards. The two cases all occurred in the computer labs. In addition, e-mails and Internet resources were used. The program will be upgraded continueously in the future. At the same time, a detailed study will be followed to investigate the effectiveness of its use. Questionnaires on computer literacy, and attitudes toward this self-learning program, as well as the design of lesson plans will be used to collect the outcome data. The net discussion tracking system, and the journal writing will be used to collect the process data. In addition, relevant suggestions will be provided regarding optimal strategies and necessary supports which go well with the use of this self-learning multimedia program.

4 Conclusions

A self-learning multimedia program was developed for English teachers' professional development in the integration of computers into the English curriculum Based on a preliminary evaluation, the program was found satisfactory. However, it will be upgraded continueously in the future. At the same time, a detailed study will be followed to investigate the effectiveness of its use.

References

[1] Kumar, V. S. ,Anjaneyulu, K.S.R,• Gupte, U. A., "VIDYA:A situated CALL environment", Computer Assisted Language Learning, Vol. 10, No. 2, pp149-172, (1997).

[2] Zhao, Y., "Language learning on the World Wide Web: Toward a framework of network based CALL", CALICO Journal, Vol. 14, No. 1, pp37-57, (1996).

[3] Keith, W.• Ines, C., "An evaluation of technology integration in teacher education for bilingual and English as a second language education majors", Journal of Research on Computing in Education, Vol. 30, No. 4, pp379-395, (1998).

[4] Schrum, L., "Technology professional development for teachers. Educational Technology", Research and Development, Vol. 47, No. 4, pp83-90, (1999).

[5] Hawkes, M., "Exploring network-based communication in teacher professional development", Educational Technology, Vol. 39, No. 4, pp45-52, (1999).

[6] Dick, W., & Carey, L., "The systematic design of instruction", Glenview, IL:Scott Foresman Company, (1985).

[7] Seels, B. & Glasow, Z., "Exercises in instructional design", Columbus: Merrill, (1990).

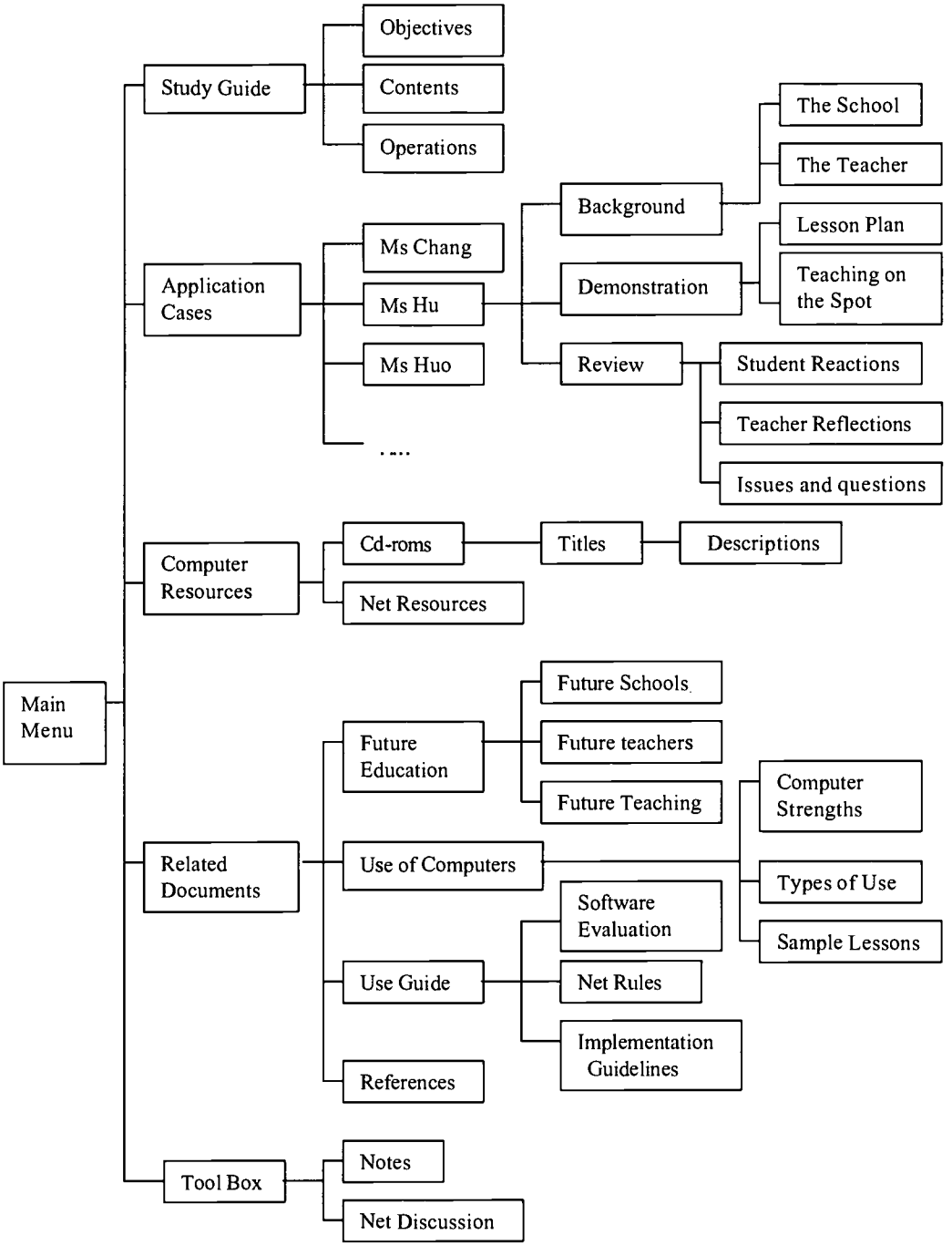

Figure 1 Framework of the multimedia program

The Production of Web-based Interactive Video From Structured Script

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The use of AV (audiovisual) media has had great impact on instruction in distance education. However, lack of a systematic methodology, existing instructional video programs cannot be used as effectively on Web as in the case of TV broadcast. Simply by digitizing video programs to AV streams will not gain much from learners' view. In our research, we propose the notion of structured script writing. The design and production of Web-based interactive video from structured script enhances reusability of content modules and reduces demand on network bandwidth. Most importantly, learners are able to conduct a hyperlink-style learning process which turns out to be much more effective than viewing video programs sequentially. Learning activities are also easily integrated with digitized media.

Keywords: **Web-based learning, Distance education, Audiovisual media production**

1 Introduction

TV production has been an effective, though expensive way to create AV media for instructional purposes. Every finished video includes an amalgamation of elements recorded in a script. A script simplifies production by specifying what and how settings, action, and actors become part of the video so the director can plan ahead. Although TV production runs routinely, the quality and effectiveness of every instructional video differs significantly. It has been evidenced that the script stage is critical for successful TV production. In our research, we take script writing to another level; i.e., structured script. The major goals are as follows:

1. *Enhance reusability of content module:* The video programs can be partitioned into reusable modules such that instructional elements may be reused or shared among different programs. Structured scripts lead to a natural partition of video programs.
2. *Facilitate the design of Web-based learning material:* The notion of hyperlinks has been used in the production of Web-based learning and training material. Embedded standard and extended tags appeared in structured scripts can map video content to HTML-like format. The mapping can be automated by software.
3. *Reduce the demand on network bandwidth:* Without partition, video programs are streaming down to users' computers which are normally hooked up to the Internet by low bandwidth access lines. A proper partition by topic will eliminate the need to transfer the whole program and thus save 30% to 70% of bandwidth usage.
4. *Automate the production of Web-based interactive video:* A typical distance education institution produces an average of 40 video programs per semester. The length of a video program ranges from 30 minutes to 20 hours. This amounts to a mass production of instructional video programs within a very short timeframe. It is both a need and a demand to automate the transformation of traditional video program to Web-based interactive video. The channels of distribution can also be diversified.
5. *Enable flexible learning sequences:* Traditional TV broadcast forces learners' to follow a non-stop sequential format which is inconvenient and against the nature of individualized open learning. Web-based open learning provides a variety of learning sequences and formats.

2 Related Research

In our research, video-based instructional media refer to traditional studio production or live instructional activities recorded on tape for later broadcast or distribution [8]. From learners' point of view, simply by watching the instructional video offers no experience of interaction. However, the visual content along with good design at the script stage could provide great assistance to learners, especially in the area of distance education. The use of interactive video in instruction and learning has been practiced extensively in both academic and corporate environments [3,5]. Improvised video programs can hardly provide effective assistance in a formal learning situation which requires precision and in-depth coverage.

Including the script stage in the video production process is a legitimate choice in most successful cases [4,8]. However, the sequential and flat nature of traditional script does not leave much room for integration with other media and for adding interaction. Structured scripts, like HTML in WWW, open a new way for producing effective Web-based interactive video. Recent advances in virtual university and network-based education suggest widespread use of computer-based media [1,2]. AV media can become part of the computer-based media [7]. However, traditional institutions need to pay for extra investment on video production and distance education institutions need to find a way to transform their video assets to digital merchandise. Structured scripts will help solve the dilemma.

3 A Definition of Structured Script

A typical script includes a video and an audio part presented along a sequential timeline. Various techniques can be used to enhance the presentation of instructional content in a video program. The elements of a script may appear in any format listed in Table 1. The adoption of these formats depends on the nature of the program, the design by content and media expert, etc. A script may contain a combination of several different formats of presentation.

Table 1. Popular presentation styles

1	*Commentary*
2	*Single performer*
3	*Interviews*
4	*Talk shows*
5	*Illustrated talk*
6	*Demonstrations (music/dance/computer)*
7	*Drama*
8	*Electronic insertion*

Most script writers are aware of different formats of presentation. However, few of them notice the formats' implications on how the video programs can be partitioned. Table 2 lists a typical script that follows traditional style. Based on the script, the director knows when, what and how to record on the tape. The actor is also aware of what should be performed by viewing the script. By the time the video program is finished, we need to scan through the tape to find a way to divide the program into video content modules. Just by looking at the script will not give us much clue about how the partition should be made.

Table 2. Non-structured scipt

Video	**Audio**
TC Java Basics 1. basic concepts 2. resources 3. related topics SP	Java is an object-oriented programming language. JDK (Java Developer's Kit) provides Java compiler and other tools for developing Java applications. ..... Java is noted for its support for cross-platform software development. Many Internet applications are written in Java.

Without making too much change, we re-write the same script as shown in Table 3, the so-called structured script. In our definition, a traditional script is composed of a video and an audio part synchronized along the timeline. A structured script is, on the other hand, distinguished by the following features:

1. *The margin of divisible units should be clear.* Suppose the video program will be partitioned by topics, the start and end of a topic should be signaled by some sort of tags. For example, the STC tag in Table 3 denotes the start of the topic, Java.
2. *There exists a hierarchy that organizes and inter-relates all units.* For example, the script in Table 3 reveals a hierarchy shown in Figure 1. The elements in the video part must be organized by certain content-specific criteria.

Table 3. Structured script

Video	**Audio**
STC Java	(music)
TC Java basics	Java is an object-oriented programming language. JDK
1. basic concepts	(Java Developer's Kit) provides Java compiler and other
2. resources	tools for developing Java applications. .....
3. related topics	
SP cross-platform	(Java is noted for its support for cross-platform software
software development	development. Many Internet applications are written in
	Java.)
Demonstration :	.....
My first Java program	Step1. Enter MS-DOS mode,
	Step2. Type in a Java program,
	Step3. Compile and test the program.

Table 1 suggests a taxonomy of video contents by the formats of presentation. There are other ways to classify the same information in a script; e.g., the table of contents of a course or a lesson. No matter which classification scheme is chosen, the content of a script will be structured according to some sort of criteria. The resulting structure leads to reusable content modules. In the design of Web-based content, these modules can easily be organized in hyperlink-style Web pages. In our research, structured script writing follows well-defined style guide which can be specified by the tags' syntax and semantics. In a practical situation, a structured script editor can be used to help follow the rules.

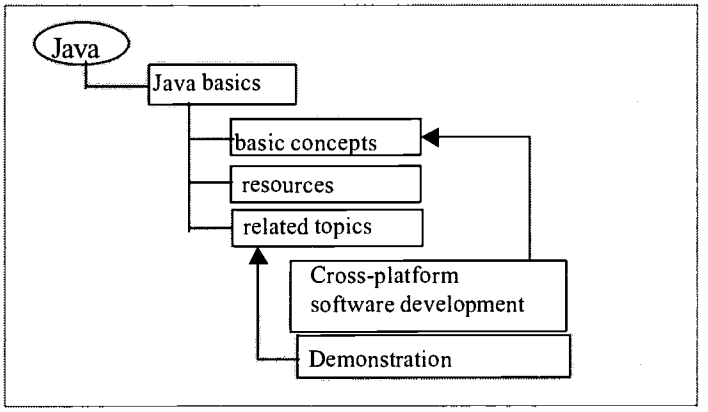

Figure 1. A hierarchy of elements

4 The Process and Methodology

Although TV broadcast still plays a major role in reaching most audience, network-based media have been growing in a pace much faster than traditional media. Since all kinds of media can be digitized and integrated into computer files, there is possibility that video-based instructional media can also be distributed in the form of network-based media. However, the design and production of traditional video-based instructional media has not been guided along this direction. Most existing instructional tapes are not able to function at least as well on the network, not to mention adding learning activities or interaction to these video programs.

Our research is focused on establishing a methodology and a mechanism for producing instructional video that works for broadcast and is able to help learners on the network. We are not aimed to investigate technical details on post-production of digital media. Instead, we are trying to look for answers on the following question, ``what kind of content in what format should be included in instructional videos and how?'' Figure 2 shows an overview of the production process. TV broadcast is more expensive and less flexible than distribution through Web hosts. However, Web access consumes a significant amount of network bandwidth for AV streams. On the other hand, studio production of videos is expensive. In the same professional area, many topics are likely to overlap in different programs. To reduce cost and enhance effectiveness, we can take advantage of studio production of video programs by changing the process of the script stage in a way that finished videos can easily be transformed to Web-ready media. The script stage is critical since later production steps are all based on the finished script.

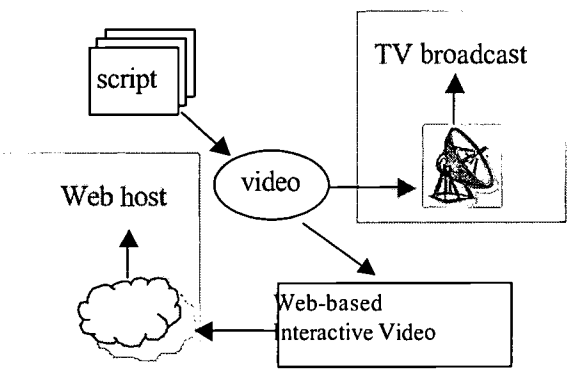

Figure 2. An overview of the production process

In order to achieve optimality among cost and effectiveness factors, there is a need to divide video programs to well-defined units. By well-defined we mean the unit should be complete and self-explanatory. Once the video program is divided into units, Web-based media will be feasible since viewers will not need to download the entire video program. The problem of reproducing the same content can also be avoided since the video unit is reusable. Obviously, the script stage is the most critical step toward a favorable solution. We re-shape the script writing process in the following ways:

1. *Component-based script creation*: Script writers or designers must be able to identify the components appeared in the script. Instead of dividing a script into components, we suggest a practice of component-based design at the beginning. Every component is identified by certain criteria; e.g., topic, presentation format, etc.
2. *Hierarchical planning*: The content of a script comes from a course or a lesson. The structure of the course or lesson is embedded in the script. At the script stage, how the content is divided or inter-related should be planned ahead. Later production of Web-based material will benefit from the pre-built hierarchy. Since the hierarchy is strongly content-specific, content expert should play the key role in this process.
3. *Extended tag set:* Existing notations used in script writing do not provide enough modeling capability for automated partition of structured scripts. We use an extended tag set. Part of the set is listed in Table 4. With this addition, it becomes feasible to develop a software editor for the creation and processing of structured script. The syntax and semantics of these tags are part of the style guide for structured script writing.

Table 4. Extended tag set for script writing

Tag	Usage
STC	The starting point of a topic
TC	Tele-card
SP	Superscription
VC	Video clip
CV	Computer video
CM	Commentary

Once the script is created structurally, studio production can proceed as usual. The next step is to import digital Beta-cam video source onto a post-production workstation. The video source becomes computer files. Since the original structured script contains meaningful tags, we can divide the video file into content modules based on the semantics of these tags. Figure 3 shows that the content modules can then be incorporated in the design of Web pages. These pages may be used and reused in various lessons, courses, and curriculum. There exists a transition between toc (table-of-contents) style and hyperlink style domain-specific contents.

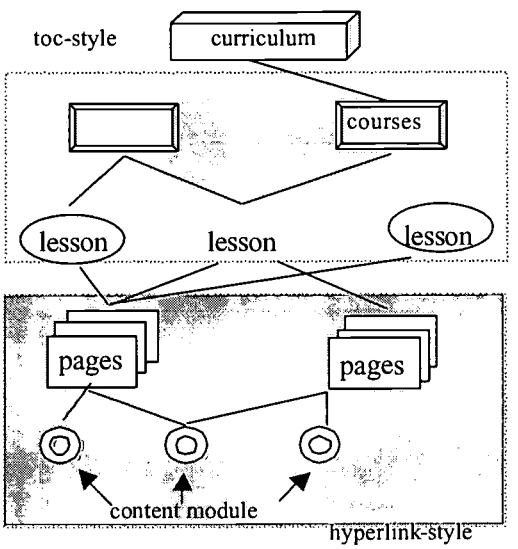

Figure 3. From toc-style to hyperlink style content presentation

The video content modules have no interaction at all. To add interaction to Web-based material, a variety of learning activities can be designed and integrated with various instructional media [6]. Figure 4 depicts the flow of learning activities. Learners start to work on the assignment through the interface of the Web browser. The assignment has been designed to help learners follow a sequence of steps to get result for discussion. The learning process can be evaluated and repeated. After finishing the assignment, learners may perform a test to see their own progress and head to the next assignment. In Figure 4, we can see that the video components produced from structured scripts are used for creating Web-based learning material. With the addition of the interactive design, the original video components are transformed to interactive video.

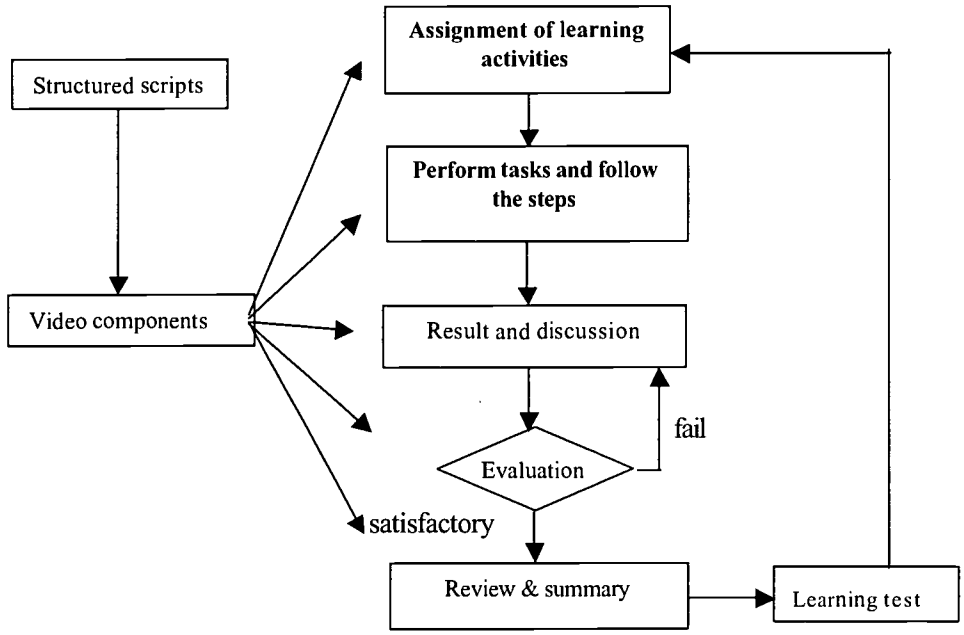

Figure 4. Interactive learning component

5 Experience Report

We choose a computing course, Data Structures, to exemplify the reference model resulted from the research. The reference model describes a formal process for producing instructional video suitable for integration with other digitized instructional media. Feedback and analysis collected from activities and experience of teaching the course is used to explain the strength and weakness of our approach.

1. Learning with interaction provides essential experience for successful learning.
2. Video programs alone are not able to provide required interaction.
3. Structured scripts are helpful for designers of Web-based instructional material.
4. The extended tag set for structured scripts should be clear and easy to use.
5. The reference model needs more instances to exemplify the use of tags, style guide, partition criteria, etc.

6 Conclusions

The learning experience by viewing a video program is different from browsing through a CBT (Computer-Based Training) lesson. However, the video part of both; i.e., traditional video programs and CBTs, may come from the same studio production process. Structured scripts have the potential of making video programs suitable for both TV broadcast and Web hosting. Content experts will take more responsibility on improving the quality and effectiveness of instructional videos. Media experts should carry on to provide assistance on the integration of learning activities with video content modules. Technical staff will then have enough information to build Web-based interactive video and other related learning and instructional material.

References

- Burgess, W. E. *The ORYX Guide to Distance Learning*. 2nd Ed. ORYX PRESS, 1997.
- Chellappa, R., Barua, A., and Whinston A. B. "An Electronic Infrastructure for a Virtual University". *Communications of the ACM*, pp. 56-58, 1997.

- Collis, Betty. *Tele-learning in a Digital World : The Future of Distance Learning.* Thomson Computer Press, 1996.
- Eustace, G. *Writing for Corporate Video.* Focal Press, 1990.
- Hall, Brandon. *Web-Based Training Cookbook.* John Wiley & Sons, 1997
- Horton, W. *Designing Web-Based Training.* John Wiley & Sons, 2000.
- McCormack, C., et al. *Building a Web-Based Education System.* Wiley Computer Publishing, 1997.
- Millerson, G. *Effective TV Production.* Focal Press, 1983.
- Swain, D. V. *Scripting for Video and Audiovisual Media.* Focal Press. 1981.

The web of the Teacher Professional Development

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1 Introduction

The education reform is one of the main issues in Taiwan. It provides an opportunity for the universities to open a teacher education program. In teacher education program, it emphasis on pre-servise, internship, and in-servise teacher training. Therefore, the lifelong learning and teacher professional development become very important for teachers. In, addition, the Department of education in Taiwan listed the lifelong learning as one of the main objectives since 1986. The government also declared the year of 1997 as the lifelong learning year (Yang, 1996). Hence, the result of this study, the TPD web site, is to enrich the lifelong learning environment for teachers to improve their professional knowledge.

Today is an age of information. The computer and Internet are changing our daily life. These new communication technologies will replace the traditional communication technologies (Hsu & Hsu, 1998). The traditional computer education emphasized the tutoring function. Although the CAI provides the learner control and independent study, it is lack of the opportunity to the students to explore their learning and to experience the discovering the results. On the other hand, the Internet connects all computers and all the information to be a big information sharing system. Moreover, people who are using Internet in education can learn the lesson in anytime at anyplace with any kind of computer system. The Internet changes the learning style from the physical, aerial, closed system into a virtual, long-distant, and opened learning environment. The resoult of this study is a teacher professional development website system. There is information for the pre-education students, for the interns, and for the in-servise teachers.

One of he main characters in the information society is changing quickly. Teachers are asked to improve their teaching knowledge and skills while they are studying in the teacher education program, or practicing their teaching skill in the internship training, or attending workshop in their daily teaching job. The process of the teacher professional development begins from the pre-servise education, and then into the internship education, and finally the education for the in-servise teachers(chang & Hsu, 1996). In the pre-servise education, students start to study a set of the education professional knowledge, and start to form their attitute, education vision, and education commitment in order to develop the special characters of the educator for these students (Jaoun, 1984). The teacher education program contains the teaching theory-based courses, the teaching method-based courses, and the teaching internship-based courses (Yang, 2000). During the teaching internship program, the students learn with the in-servise teacher and the professor. The students get into the school system to learn all kinds of the knowledge and skills in school based environment (chen, 1995). For the in-servise teachers, though, they are accumilating lots of teachiing experence, they need to reflash their teaching knowledge and skills (Lee, 1996). Therefore, for those in-servise teacher with different kinds of teaching needs, the education program should consider the teachers needs and encourage them to work togather to help each other in order to meet their teaching needs (Moursuond, Bielefeldt & Underwood, 1997). Hence, this study is based on the theory of the teacher professional development to development a virtural communication environment for teachers in order to achieve the goal of the teacher professional development.

The TPD web site will provide the information for all kinds of teachers. There are two purposes of this study. One of the puropose of this study is to enrich the literature of the teacher professional development. The other purpose of this paper is to build up a network-learning environment for those who are in pre-teacher program, internship, and on job training to improve their professional ability.

2 Conclusions

The result of this study is to build up a teacher professional development web site(http://www.tep.tku.edu.tw/3ic). It contains pre-servise education program courses, the information for the internship teachers, and the lifelong infromatioin for the in-servise teachers. There is a virtural classroom to provide the teaching manegement function to teachers. In addition, it contains the communiction function to various of teachers by using disscussion groups or BBS. The function of the questionnare is to provide a tool for action research. When teachers use this function to create the questionnare and send it by e-mail or web, the system will collect and analysis the data.

This study is based on the theory of the teacher professional development to develop a web site. The result of this study is not only to build up a teacher professional development web site but also to enrich the literature of the co-operative learning model. By developing this virtural lifelong learning web system, the future studies on the co-operation between different kinds of teachers are needed.

3 References

Hsu, F. C. & Hsu, C. L.(1998). The behavior for Media choice in Taiwan. Proceeding of the International Information Management Conferrence. pp.469-479.

Chang, Y. F. & Hsu, C. L.(1998). System Development for Teacher Professional Development, *Instructional technology & media*, No. 40, pp.3-11

Yan, K. S.(1998). Lifelong Education Policy and Strategy in Taiwan. Paper present at Educational Technology and Lifelong Learning.

Joan, C. W.(1996). Teacher Professional Development –Theory and Practice. Taipei. Wu-nan.

Chen, M. Y.(1997). Teacher Profession-Teaching Concept and Practice. Kaochun. Li-wen

Moursund, D., Bielefeldt, T., & Underwood, S. (1997). Computer Technology and Professional Development: Suggestions for schools. Http://www.iste.org/Resources/Projects/RoadAhead/Pd.html

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